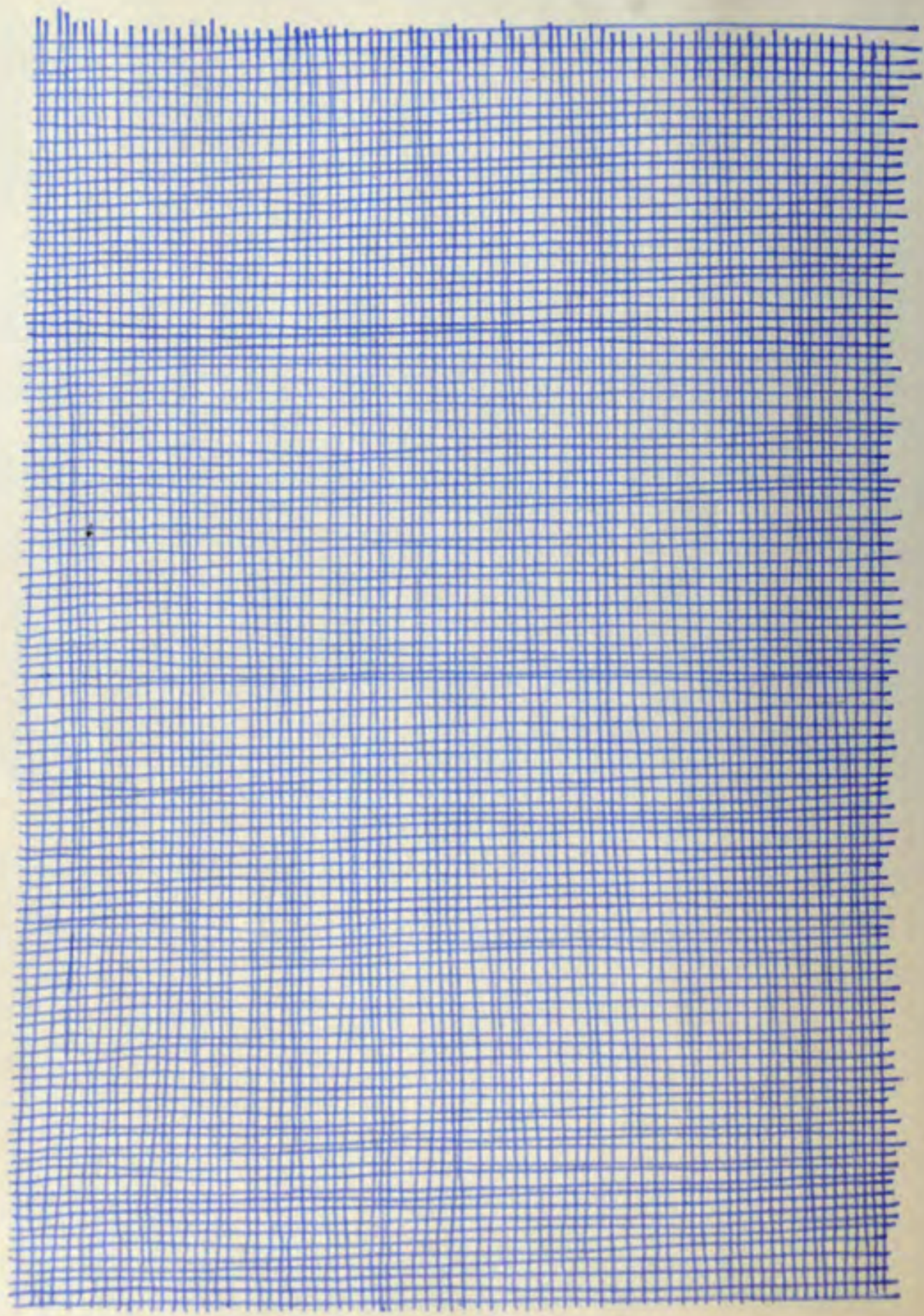
ActIII MWMWI

MWMW1 is conceived as an introductory workshop for entry level learners. Its account is written and designed as an illustrated manual. The manual is based upon the experience and transcriptions of the entry-level course but surpasses the transcriptions in the sense that the manual describes MWMWI as an intention, as a design. Based on the study and experience of the implementation the manual explores tools for a next implementation. For the experienced reader/ draughtsman the chapter will offer few novelties. The innovation of MWMWI lies in the complementary, blended, exploration of physical and digital activities and its game-like structure. The game's constraints introduce a hint of discovery and facilitate an overflow between digital and physical activities. MWMWI introduces basic notions of architectural drawing: projection, parallel perspective, vantage point perspective and basic visual literacy studied by developing an affective architectural artefact. The manual is directed at novices in architectural design, to introduce them into the basic concepts of architectural drawing.

1 **drawing lines**

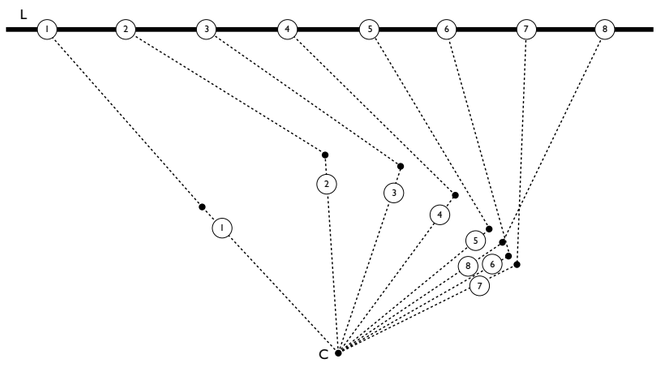


(image previous page, author): drawing a freehand grid, fountain pen.

(diagram, right) movements from the wrist, elbow and shoulder (C) while drawing a straight line (L) Redrawn from Arnheim (1954) The scheme equally figures as a diagram to illustrate the transformation from a regular human being to an architectural draughtsman. As our limbs do not pull straight lines naturally, it is something we have to master, something we have to practise over and over again until we forget how to do it. As a line forms itself upon the drawing paper it informs the muscles and eyes on how to adjust movements to control the straightness of your line. The same goes for other types of lines. Experienced draughtsmen know how to adjust their limbs in order to draw specific lines. Visual and muscular adjustments have become a tacit ability, an embodied procedure which is unconsciously used within the activity of drawing. [2]

'A drawing is simply a line going for a walk.'

Paul Klee [1]



1.1 Point and Line

What is a line? Geometry wants us to believe it is the shortest connection between two points but what if you tremble? What if your hands start wandering? Vectors also define the distance between two points, describing an arrow from one point to another one in space. Vectors do not tremble let alone wander. In drawing the written and the computer processed line are the essential elements to convey formal and spatial understanding. MWMWI will explore the line and connecting lines in order to convey formal and spatial understanding: straight ones, slightly sloped ones, thick ones, thin ones, lines long and short... Lines are the basic elements of drawing, they define the area between what is drawn and what is not, they define meaning. Not only straight lines for that matter, patterns, hatches, dots, gradients, tones, ..., they all form a part of the vocabulary of drawing.

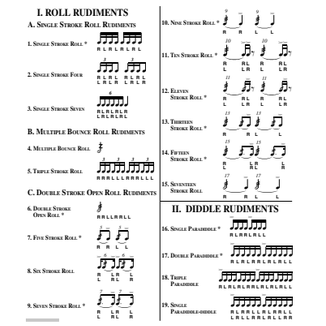
Lines can be interpreted as conceptual vessels (the lines stand for something else) and can be used conventionally (the lines mediate) practically (the lines acquire form, depth, volume), or autonomously (the line is used for its pictorial quality) or something in between. In the academies of the 19th century where drawing effectively constituted a highly conceptual system, lines were seen as the prime element of a language concerned with the imitation of reality.[3] The historic avant garde started to dissect the line as a prime element for drawing.[4] The line emancipated from its pictorial role to become a defining or autonomous element in its own right. In drawing lines one becomes aware of their infinite power to express. In the Bauhaus' '*Vorkürs*' (basic design courses) Wassily Kandinsky, Josef Albers and Johannes Itten started to study the graphical power of lines and dots as catalysts for spatial constellations. Drawing lines, dots, connecting them to form rectangles, squares, circles and other shapes were considered as standard exercises to provoke imagination. Lines were extended beyond the drawing and lines were also explored within models and spatial constructions. Through inquiring different aspects of the line students were able to discover tensions and possibilities of linear compositions.[5] These exercises became part of standard design education and were, over the years, reinterpreted and perfected to minor or greater extent by drawing and design teachers all over the world. Throughout the following we will explore aspects of the line to explore.

1.2 Drawing Rudiments

Practising drawing lines can be compared to rudimental (march) drumming which defines the basic building blocks for (march) drumming. Rudiments are basic left-right patterns which train and extend a drummer's motor abilities in performing rhythmical patterns and define the vocabulary of drumming. Line drawing hasn't been formalised as the drumming rudiments but the principle is similar. Artist like Giorgio Morandi, Josef Albers, Victor Vaserily, Piet Mondriaan, Roland Seuphor, Louise Bourgeois, Sol Lewitt amongst others have explored the limits of drawing lines as defining elements of Drawing. MWMWI uses line drawing as warm-up exercise.

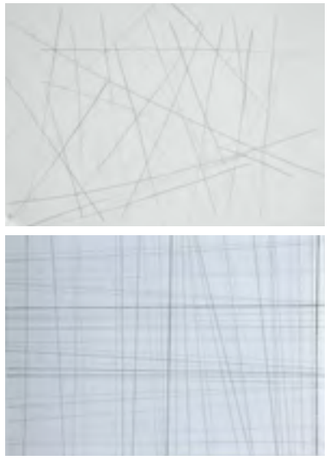
Drawing lines is about developing hand-eye coordination. Draughtsman and instructor Chip Sullivan:'*It is important to first establish your relationship to the line and learn to judge distances. Through the drawing of lines you produce a landscape that determines how the environments you create will be perceived*'.[6] Sullivan compares lines to letters in the alphabet, they possess calligraphic meaning. Architect-drawing instructor Paul Laseau starts his '*Freehand Sketching*' in a similar manner; basic line and dot drawings to train one's motor abilities in drawing.[7] Before you start practising lines a short note on holding the drawing instrument. Non-draughtsmen tend to hold drawing tools as they hold writing tools but the activity is fundamentally different. Rudimental line drawing is a perfect starting point to learn and unlearn the inclination to adopt writing positions while drawing. According to Sullivan we have to learn to *'see the drawing tool as connected to your hand, eye, and mind, and it can be a pathway to freedom*'.[8]

Working with drawing tools has more in common with using cutlery than it has with writing sentences. While eating you constantly shift your knife and fork to perform different functions. Think **about** the movements needed to fix a grilled fish in order to peel off the flesh from the bones. In order to draw a horizontal or vertical line you will discover similar shifts in fine motor movement. Draw a horizontal line on an a large sheet of paper. Remember Chip Sullivan's advice: '*Grip the drawing instrument lightly, move freely, achieve looseness. Hold the instrument like a chopstick and push it forward; feel its movement on the surface of the paper, feel it caress the paper.*'[7]



International drum Rudiments (source Percussive Arts Society).

(author) Practising vertical Lines, Fountain Pen on Paper



drawing lines (top) Erika Van Houdt (bottom) Lynn Janssens

(oppositie page) exploring divisions and squares (top to bottom): Dividing Lines (Rosa Fens); Dividing Squares and Triangles (Laura Reyniers) ; Dividing Squares (Heleen Verheyden); Dividing Lines, Squares and Circles (Anton Parys);

(opposite page) Squares and Triangles (Hendrik Anton Denys); Exploring circles (Ruth Dierick)

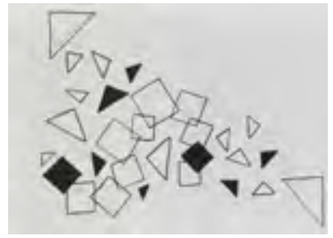
You will discover your line will follow the anatomy of your body, it will end up slightly bent. Keep that line as proof of your first attempt. Take new sheet and draw another one. Slow down, redirect your arm from the shoulder up to the wrist while gently pulling the line. See how you are able to redirect and adjust your body to draw a straighter line. Now, as close as possible, draw another line. Now slowly draw a line in the opposite direction. Try it horizontally, vertically, from left to right, right to left. Why not try it with your eyes closed? With your odd hand? Draw until your sheet is filled with lines. Now take a closer look. Which line is the most appealing, the worst one? Take a new sheet and improve them, keep on drawing parallel lines as close to each other as you can. The longer you practice the straighter your line will be, the more your body and mind will bent in a new way. You can also try it on smaller scales and draw lines from your elbow, your wrist or fingers. Every time you will discover that you have to control the movement of your limbs for the line to be straight.

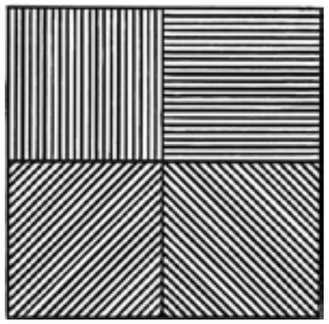
Drawing lines from the hand trains your hands to follow your mind, while thinking, in action. Practising straight lines also maintains your sketching ability, very much like practising rudiments (or scales) support your instrumental skills. The craft history of architectural drawing has perfected devices and machines to aid the draughtsman in drawing lines: T-square, carpenter's square, compass, fixed parallel rulers and, more recently, digital devices. They all possess their own distinctive qualities and facilitate drawing to a certain extent. The introduction of digital drawing tools have extended the traditional physical means for doing so. Explore those tools and compare the activity and result to your previous attempts to draw straight lines. Repeat the previous exercises using a T-square, the computer's mouse, the trackpad of a laptop, the surface of your tablet computer and if possible a pressure sensitive pen. Familiarise yourself with their potential as complementary tools for thought and expression. You can also use brushes, dusters, tape, sharp pointed materials, string, wire, spray cans... Explore whatever comes to mind to extend yourself.

1.3 Proportion

Drawing, sketching architecture is about estimation, gauging of distances and subdivisions. While processing forms and spaces you delineate proportions which stand for a plan, a section, an elevation or a perspective drawing. In order to train your ability to plot proportions you have to practise to estimate divisions and proportions. Take a new sheet of paper and draw a line of approximately 10cm. Now divide that line in two equal halves. Check the equality using your drawing instrument, measuring the distance of one half by using your thumb, and comparing it to the other half. Amend the distance by drawing a new divide. draw a longer line, try again, until you have plotted two equal halves. From the middle estimate the distance of 1/6th and copy that distance to the other end. This estimation divides your line in three equal halves. Again check whether the distance is aptly estimated and improve until you discerned three equal halves. In order to divide uneven measures you have to start from one of its parts from the middle. Three consists of measuring 1/3rd laid out from the centre, five starts by estimating 1/5th from the middle, seven 1/7th and so on. 9 is the same as dividing in three's. Dividing lines could be considered as a second type of drawing rudiment.

Now draw straight angles. Two lines which cross each other in a straight angle. Try to be as precise as possible, fill a page with lines crossing each other at straight angles, as much as possible. From the straight angles you can construct triangles, trapeziums, parallelogram and squares. Work towards proportions, constructing 2/3 triangles, subdivided squares in nine equal squares, subdivided trapeziums, parallelograms.... Fill a sheet of paper with these (subdivided) geometric figures, again work towards a composition, fill the page until it becomes a geometric mess, work on accuracy, divisions, proportion and composition.





Sol Lewitt; (1980); Bands in Four Directions

Sol Lewitt; (1971) Wall Drawing #65 (detail): Lines not short, not straight, crossing and touching, drawn at random, using four colours, uniformly dispersed with maximum density, covering the entire surface of the wall, on an interior wall of the concourse level galleries of the East Building, National Gallery of Art.

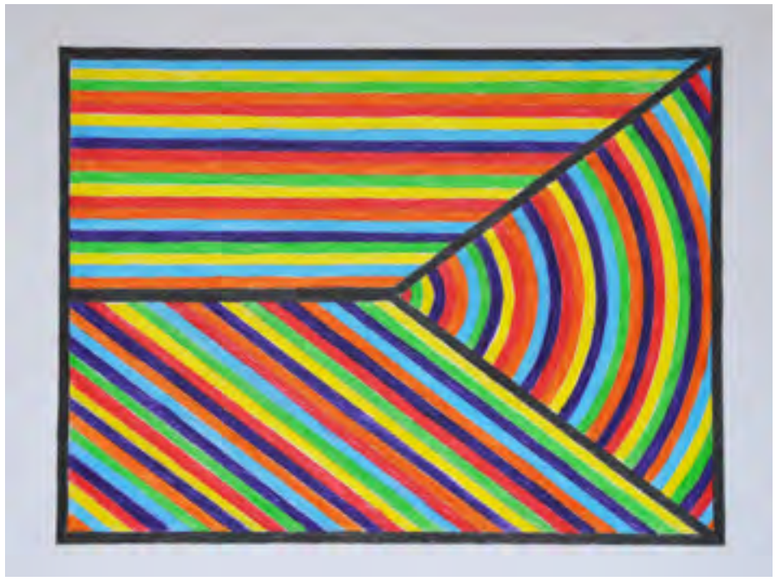
Sol Lewitt; (1972); Black Circles, Red Grid, Yellow Arcs from Four Sides and Blue Arcs from Four Corners
(opposite page) So'Lewitt: (top) Laura Reyniers; (middle) Laura Boudewijn; (bottom) Aaron Swartjes

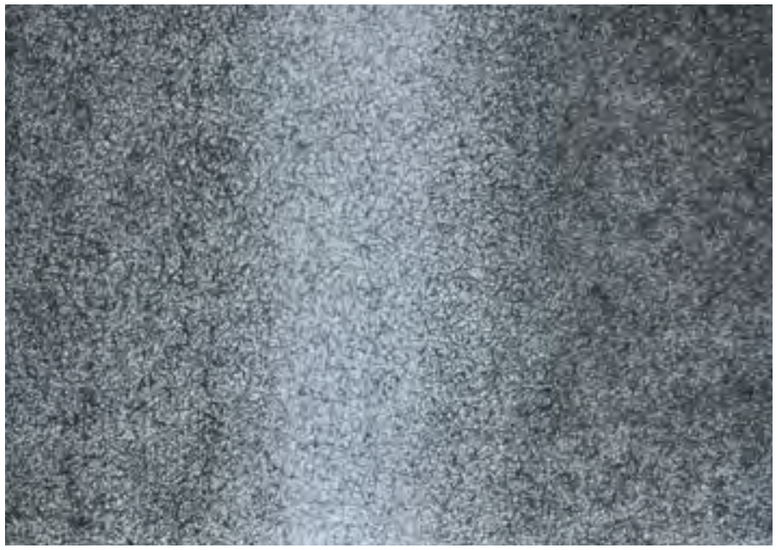
1.4 "So' Lewitt", Sol Lewitt's legacy

Many books about drawing spend considerable attention to the meaning and value of the line. Drawing from several examples you can easily spend a few weeks drawing dots and lines, if only to embody the tools and the movements. The line, as a defining element to and for drawing, is so important some artists have made drawing lines a part of their practice and artistic output. In much of Sol Lewitt's work, which could be read as an inquiry into the limits of the basics of the '*Vorkürs*', the drawing of lines is taken taken to the extreme to define rudimental forms and figures. While his drawings search for an autonomy of basic figures of drawing i.e. the line, the square, the cube, the circle, ... The drawings accompanying his research into the basics of drawing could be read as an artistic attempt to formalise drawing into a set of protocols, basic elements. I would like to invite you to look up a monograph concerning Sol Lewitt's work and study the thinking and visual account of his drawings. From this inquiry try to discern or define a protocol and execute it, free handedly, on an A3 sheet of paper, as a synthesis of your first introduction into drawing lines.

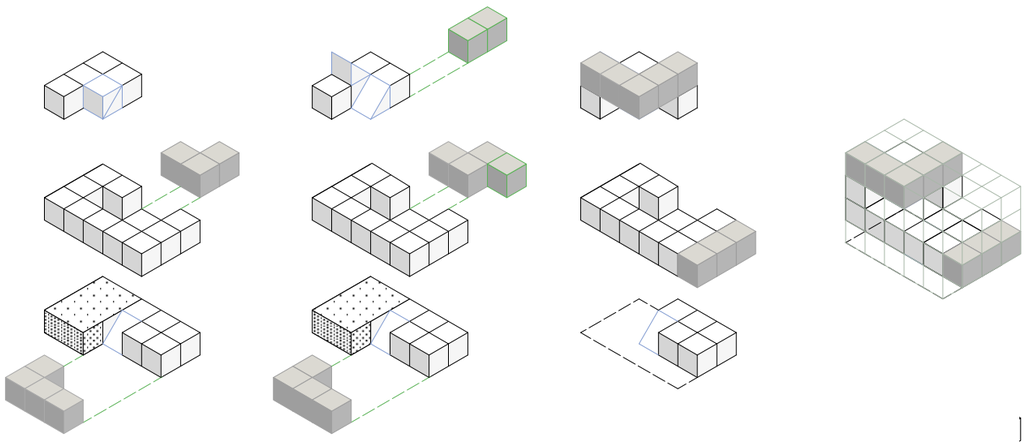
As the lines accumulate upon the surface try to think about density, proportion, composition, tension, spacing, value. the great thing about drawing lines this way is that it tends to be a meditative activity. The aim is not to speed up but the slow yourself down so that the activity resides somewhere between the conscious and the unconscious. As your drawing will progress your thoughts will start to wander. As they do, keep drawing, keep pulling lines so that the drawing of lines becomes a second nature.

Draw until your personal senses are appealed. Every expression you make should matter, so should the choice of your drawing tool (discover the difference between several pencil hardnesses, between pens and pencils, perhaps try brushes, use different computer applications to draw vectorised lines and pixelated lines...), try (to print upon) different paper qualities. Remember that is important to work slowly, concentrating on the marks made by each movement. Executing your rudiments haphazardly will yield scruffy drawings and ignores the idea of learning to assess the process of movement and the line that results as a consequence of that process. Drawing a straight line slowly is more difficult than hastily scratching a straight line across the paper.





2 solid modelling



Modelling Constraints:
• Your model remains three cubes wide
• The entrance is made at the front of your model, to create the entrance you'll have to retrieve a cube. This cube cannot be replaced by a stairway cube. Stairway cubes can be positioned next to the entrance.
• The ground level keeps the initial grid (three by five). From the first floor onwards you will extend the model by re-inserting at least one cube on either or both of the short sides. Thus extending the initial grid by one or two cubes. The plan of your model will maximally be three by seven cubes.
• Your model will consist of three or more floors.
• The number of cubes you insert into your model remains the amount of cubes used in your final model.

2.1 Creating the 'solid' model (physical modelling)

Build a set of 36 cubes, approximately 3x3 centimetres (or larger). Cut two of the cubes diagonally in half (these will figure as stairs). Align the cubes in a three by five constellation, three storeys high (the third storey consists of 6 cubes positioned at the back of the model). The bottom six cubes are affixed, they figure as context.

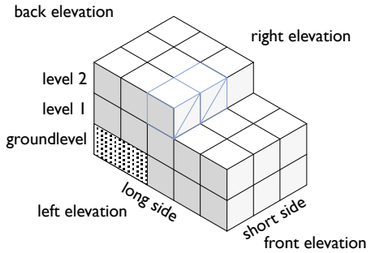
The following process will define a circulation route through this lump of blocks. Try to imagine each cube as a room, as a unit. Don't worry about its dimensions yet, just think of every cube as a room. Cubes which are positioned next to each other represent larger rooms. A room is unlocked when one side of a cube is fully revealed to the internal circulation route.Creating a passage will gradually unlock the rooms.

In order to enter the model you will need to remove cubes. On the short side, bottom row, take away a cube. You have three choices: left, middle or right cube, You can can also take two, three or more. The more cubes you retrieve the more spatial possibilities you will create. Taking away cubes unlocks the yet undefined rooms. In order to make the rooms accessible you have to open them up from the inside, by creating a circulation route. Don't think to hard, follow the path your actions indicate. Whatever you did, you have now created an entrance, a hallway. A space where you can enter the structure without being exposed to the weather. Welcome...

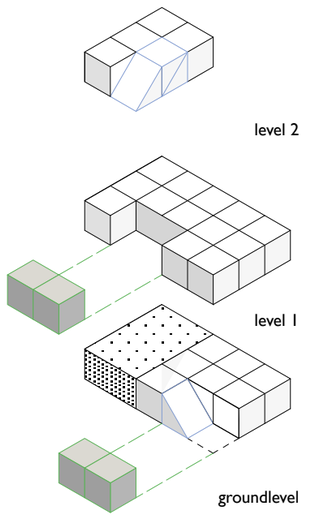
Now you will have to create a stairway. Stairways consist of a takeoff platform, the stairway, the stairwell and a landing. The goal of the circulation route is reaching the upper floors or the roof scape. In order to reach the second floor use a 'stairway cube' (a diagonally cut cube). The inserted stairway unlocks the second floor. Now you will have to look for a passageway to reach the next level. Remember that all rooms, all cubes, have to be internally accessible. In order to enter them you will need some kind of corridor. When positioning your second stairway check whether all the cubes are accessible by disclosing them. When an area is unreachable, reposition cubes or the circulation route. When the second floor is unlocked position a new 'stairway cube' to open up the third floor. Again you will need a take-off platform, and a landing.

You now reached the top floor but you are left with a set remaining cubes which you will have to reinsert. You will do so along the following constraints: the ground level keeps the initial three by five grid, from the first floor upwards you will have to extend the grid by at least one unit by adding a (row of) cube(s) on either short sides, or both. The former extends your grid to 3x6, the latter to 3x7. As you reinsert cubes you will also be forced to think about new circulation conflicts. These are resolved by using the same constraints used to define the walkthrough (all rooms have to be accessible; a stairway consists of a takeoff platform, the stair, the stairwell and a landing; the walkthrough reaches the upper floor or roof scape; your model is, at least, 3 storeys high). There is no limit as to the number of floors you can create. You can retrieve as many cubes as is structurally possible (keep in mind cubes cannot float in the air).

When you have modelled all floors tape (or glue) the single floors together and stack them on top of each other to check whether the inside circulation route corresponds. Study your model, imagine entering your model and following the route you have planned towards the roof, hopefully without bumping your head or falling off. Try to imagine the route as a full scaled space of 3x3x3 metres.



Startup Model: Front Elevation; Back Elevation; Left Elevation; Right Elevation; Ground level; Level 1; level 2; Short Side (latitudinal); Long Side (longitudinal)



Stairway principle: a stairway minimally deletes four cubes: the entrance, preventing us to open the front door onto a stair, the stair, allowing us to go up, the stairwell, which avoids bumping your head while going up and, finally, the landing to avoid crashing into a wall or falling into a void while running upwards. Put the retrieved cubes on the side.

(note) Aligning the plans horizontally is the most informative way to structure the reading but, if your paper space and composition, forces you, you can also order plans vertically, perhaps you will want to rotate them. The important thing here is to be consistent. Make sure to provide enough space between the plans, three centimetres will do for us, as it provides some space next to the plans to add descriptions, measurements and other indications; and provides enough space between the plans as to discern one from the other. Make sure to leave at least 1/4th of the paper open for other drawings. The alignment of the plans will structure the rest of your presentation. Try to structure the sections and elevations around the alignment you created by aligning the plans. Work towards a composition, the sum of the parts (plans, sections, elevations) forming a consistent whole, preferably a rectangle-like composition as it creates a sort of visual tranquility.

2.2 Drawing the model

2.2.1. Orthographic Drawing

(A) Depending on the total length of your model plot a dotted three by six – or seven grid on a sheet of paper (one unit can be represented by a 1x1cm square), these are the margins of your plans. You can draw your grid either by hand, by using a ruler or in a computer application.[9] Draw the grid as many times as you have created floors in your model and cut them out. (B) Count the number of storeys you created and draw a new dotted grid which measures your total length combined with the number of storeys (minimally three by six). Draw the grid four times and cut them out. (C) Finally draw a dotted grid which measures three units by the number of storeys. Copy them as many times as you have units on the longitudinal axis of your model plus one. Again cut them out.

From these cut-out grids lay out a planimetric presentation of your structure. Take a sheet of A3 paper and from (A) align the grids which are to represent your plans. From (B) and (C) add the sections, two longitudinal sections and five or six cross-sections. Finally from (C) add the elevations. Planimetric presentations are about communication, looking for the right order, and composition, to communicate a design. Adhering to the convention of projective drawing allows your structure to be read by everyone initiated into the language of architectural representation. Exploring projective drawing yourselves initiates you in the language of projective drawing. Aligning the plans horizontally is the most informative way to structure the reading but you can also order plans vertically, perhaps you will even have to rotate them. The important thing here is to be consistent. Make sure to provide enough space between the plans, three centimetres will do for us, as it provides some space next to the plans to add information and provides enough space between the plans as to discern one from the other. Make sure to leave at least 1/4th of the paper open for other drawings. The alignment of the plans will structure the rest of your presentation. Try to structure the sections and elevations around the alignment you used for the plans. Work towards a composition, the sum of the parts (plans, sections, elevations) forming a consistent whole, preferably a rectangle-like composition as it creates a sort of visual tranquility.

Put an equally sized sheet of tracing paper on top of your cut and pasted composition or, alternatively open your drawing application. Lift the upper storeys of your model and look at your ground floor. As our circulation route is empty we will leave the passageway white and add a tone, hatch or pattern to the areas where the cubes are positioned. Your plan will communicate solids and voids. Within the planimetric representation the 6x6 will be left out, creating a cantilever. Do not render individual cubes but outline their sequence. Two cubes in a row, for instance, become a one by two rectangle. The darker areas represent solid areas and the white areas the areas you opened up. The spot where your vertical connection is positioned, i.e. your stairway, is marked by drawing a triangle from the bottom to top, indicating the slope. The point of the triangle indicates the direction you ascend. Let us agree that we draw the arrow in dotted lines to indicate that the stair is going up and above. When you have indicated the elements making up your ground floor, check the upper storeys for overhanging elements or other openings. An overhanging element is indicated by a dashed line, an opening in an upper level by a dashed crossed rectangle. Draw these linear elements in a thinner line than other lines, indicating the secondary status.

Now put your model's first floor on top of the ground floor. Repeat the same procedure, mapping solids and voids and make sure the second floor's cubes position matches the one of your ground level's cubes. Use the same drawing codes to map the constellation. Check whether the constellation reveals information about the underlying ground floor. Check whether you can discern elements looking down from your first floor to the one below. If you do see cubes or portions of the platform, copy them using thin lines and render them in a light grey tone in a full line. You should minimally be able to discern the stairway, otherwise you cannot reach your first floor. The 'arrow' of the stairway arriving at the storey your drawing can now be labelled with an uninterrupted line. The stairway which goes up, to the second floor, can be indicated with a dotted arrow. Again check the upper storeys for overhanging or open areas and map them. Repeat this procedure until you have reached the top floor. There is no need to draw the roof's shape as the drawing of your last floor will provide enough information for that part of your building.

For the sections the procedure is similar to drawing plans. When drawing plans we are cutting through our building horizontally, approximately a meter to a meter and a half above the floor (for convenience cut the structure at three metres). When drawing sections we do the same thing but vertically. Put your model together and take away, or imagine taking away, a vertical row of cubes. The split will reveal two sections. One looking inside the model and the other one on the interior side of the row you just pulled away. Depending on your construction you can maximally draw six transverse sections and two longitudinal sections equalling a total of eight sections. As you draw the sections label them upon every storey of your plans by drawing a coloured, thick, line on the spot where you make the section (for instance section AA, section BB, ...). The line extends the length of the section and, by drawing arrows, indicates the side where you look to. Sections are based upon projection. The section line acts as a projection surface. From there you look into your model, all the lines and shapes you are able to see are projected onto that line.[10]

A section shows a projection of the interior of a building. The cubes you cut through will be rendered black, to indicate they are solid, and cut through. The cubes behind the cut row will be rendered in a light grey. The deeper a cube the darker it will be rendered. Do not render these tones too dark as doing so would yield confusion between the cut area and the cubes in the background. The goal of the sections you are preparing is to reveal the circulation route going upwards, the inner space of the lump of blocks.

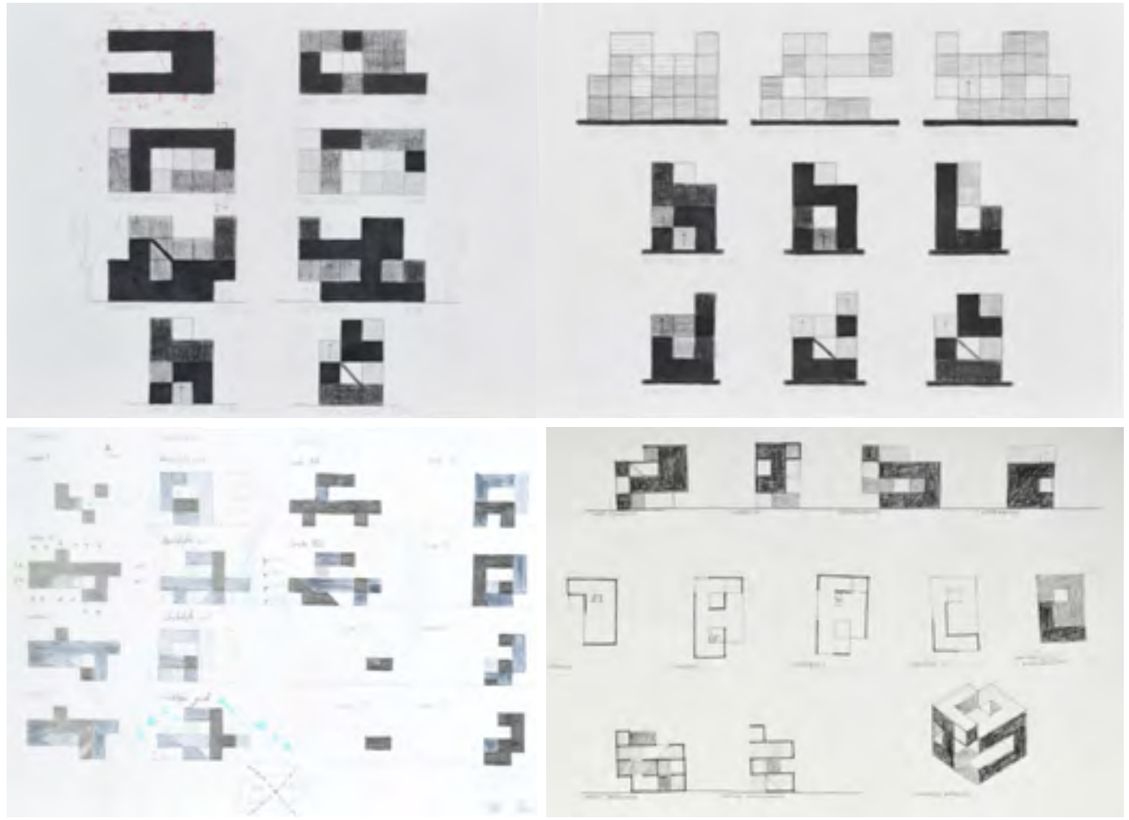
First plans on pre-printed gridded paper, the template enabling the learners to quickly map out their plans, sections and elevations (top) Caro Baens; (middle) Eline De Borger; (bottom) Lore Desmet

Elevations, by directing a light onto the model the effect of the sun can be discerned (Emmanuel Haesendock)

Finally you will map the elevations. Elevations use the same principles as sections but without cutting the structure. An elevation is a flat representation of the exterior plane of a building or structure as if looked upon from a distance, frontally. To visualise your structures' elevations frontally look at all the sides. We will draw a front elevation, left and right elevations and a back elevation. In order to discern between a section and an elevation you can use slightly different drawing conventions. The front plane of the elevation will be drawn by an outline, perhaps rendered in a light tone. The row behind the front row will be rendered in a light grey tone. The deeper you look into your model the darker the tone will become. Doing so will replicate a volumetric appearance. Finally direct a spotlight onto your model and check the shadows. Overhanging cubes will create a cast shadow onto your model, copy the shape of these shadows onto your model.[11]

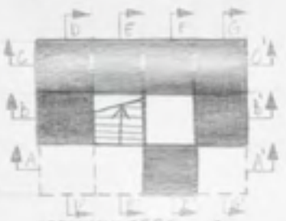
Some notes on communication. When setting up a plan look for a logical ordering. Keep in mind western people read from left to right and from top left to bottom right. Try to organise your drawing so that the reader is able to follow your story. There are many possibilities to organise your drawing. They are governed by the proportion of your paper, the amount of drawings you intend to include on a single sheet and the scale and directions used within your presentation. As a rule try to fit as much information as possible on a single sheet. Avoid scattering your drawings around your page and try to minimise the number of pages the non-aligned drawings will distort the legibility of your proposal. The scale I proposed allows you to draw all plans, sections and elevations on a single page while maintaining enough space to draw a parallel perspective (see chapter 3). When all the projections end up on a single sheet one is able to easily move and compare spatial information from plan to section to elevation in one view instead of having to leaf through several documents. If this is not possible always keep plans and sections as close as possible to each other.

When you have arrived at drawing all the plans, sections and elevations copy the presentation onto a tracing paper by using a refillable lead pencil [0,5mm] or tracing pens. You can also use coloured leads or pens to discern certain information. Start by drawing the plan grid in a thin line which will represent the centre lines, or axises. Label them to be able to communicate positions (1,2,3,4; horizontally and A,B,C,... vertically, upwards). Copy the plan information (solid, void, stairs,...) and indicate the kind of plan we are looking at (i.e. ground plan or ground level, first floor or level 1, ...). Add the section lines. Copy the sections. The vertical (perpendicular to the surface level) grid lines will be labeled according to the labels used in your plans. Add a fat line to your sections which extends from the outer edges, this line indicates the surface level. Extend the ground level cubes with a short line to suggest a foundation. The horizontal (parallel to the surface level) grid lines will be labeled by indicating their height (3 metres). Label the sections according to the labelling for the section lines in your plans (AA, BB, CC, ...). Draw the elevations, draw a fat line underneath the elevation to indicate the surface level, you can even choose to add a hint of background (by drawing or collage technique) and label the elevation (front elevation, right elevation, left elevation, back elevation). When you have worked in a digital drawing application try to emulate these conventions using digital alternatives.

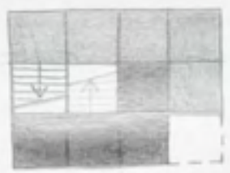


(opposite page) plansets (top): Isaura Doumen; (left) Anton Parys; (right) Rosa Fens; (next page) Rani Couckelbergs

PLANNEN

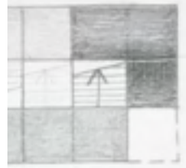


GELIJKVLOERS 0

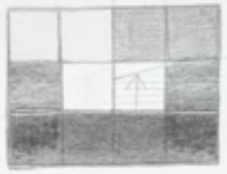


1STE VERDIEPING +3

2DE



VERDIEPING +6



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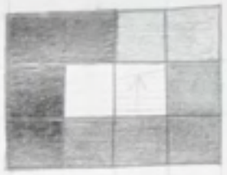
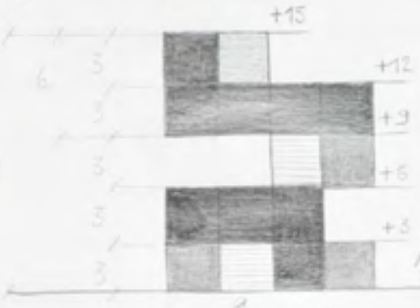
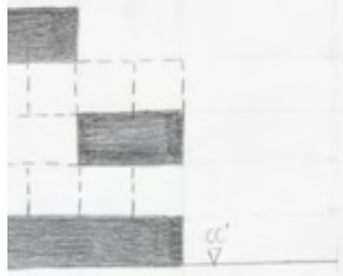
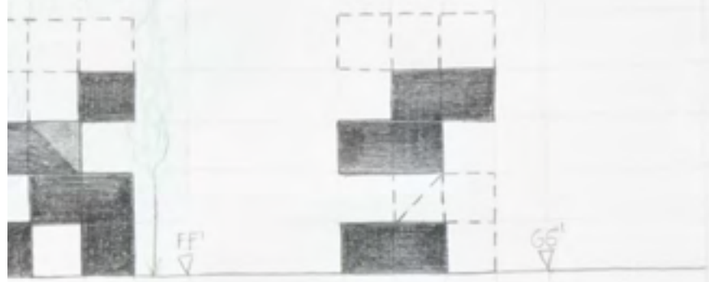


4DE VERDIEPING +12

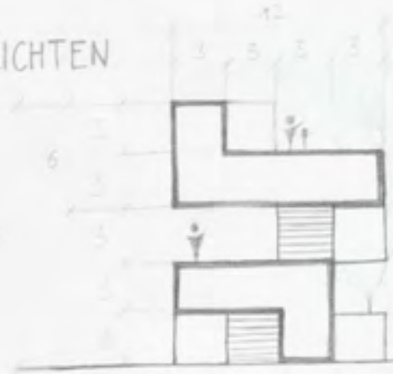
SNEDES



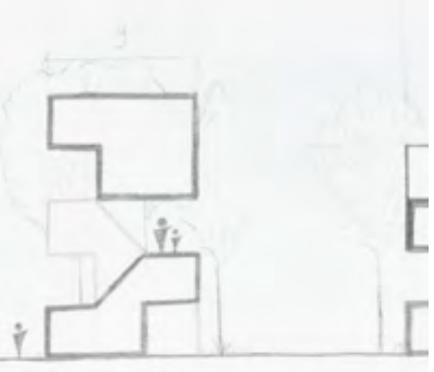




AANZICHTEN



RECHTER ZIJAANZICHT



VOORAANZICHT

NKER ZIJAANZICHT ACHTERAANZICHT

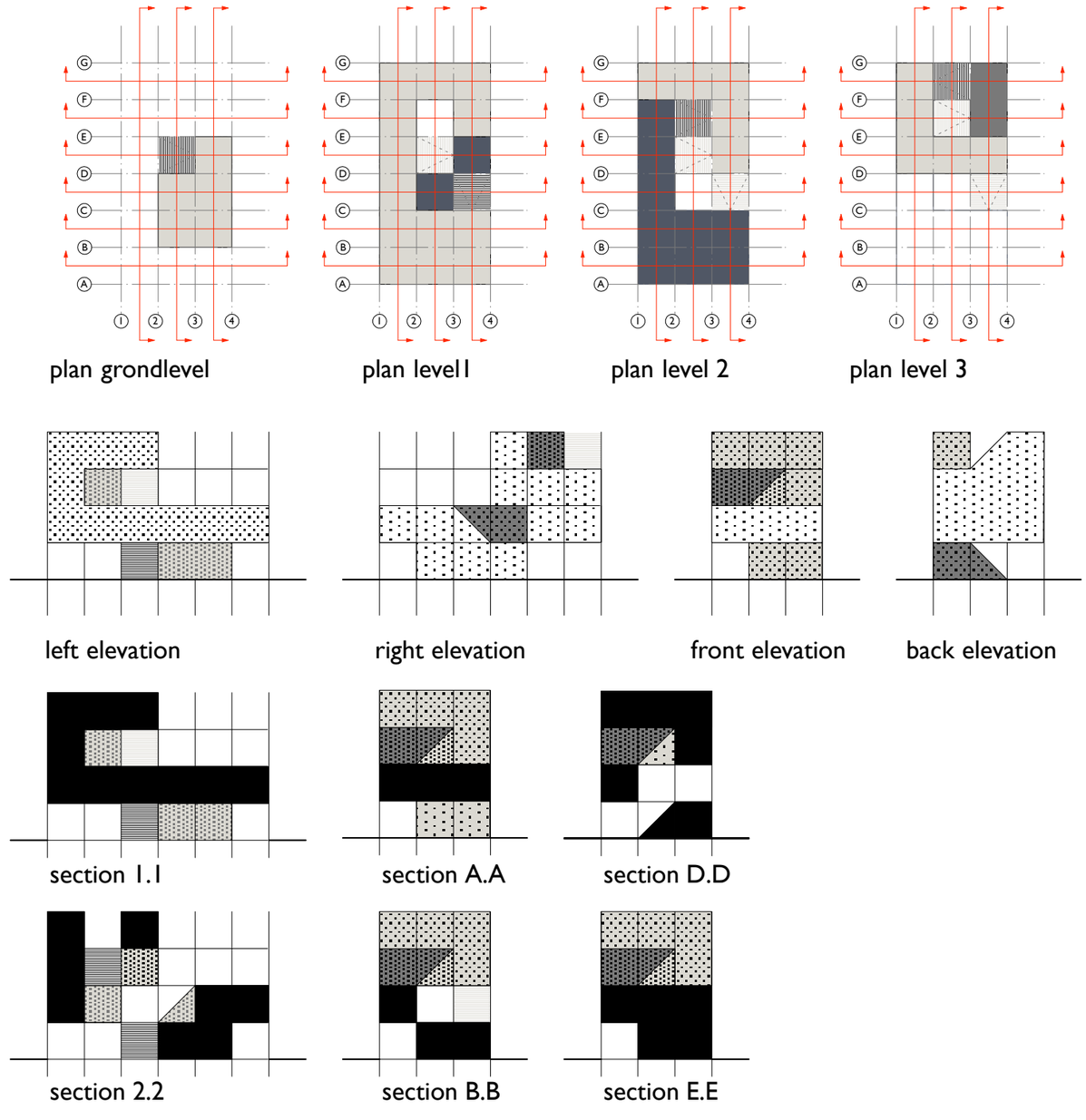
2.2.2 Digital Drawing

In order to translate our structure into digital vectors you'll need a vector based application.[12] Based upon your drawn lay-out we will copy the plans, sections and elevations as a constellation of vector-based lines. The plans will form the base to construct our virtual 3D-model. The major advantage of digital drawing is its versatility which allows you to edit and move drawings around infinitely as your ideas evolve. Physical drawing is kind of destructive, every decision permanent, you have to plan your actions well ahead to avoid unexpected conflicts. Not so in the virtual domain. You can drawing wherever you want and compile your lay-out when you have discerned all the elements. Since you already explored a composition the quickest way is to move along the same lines.

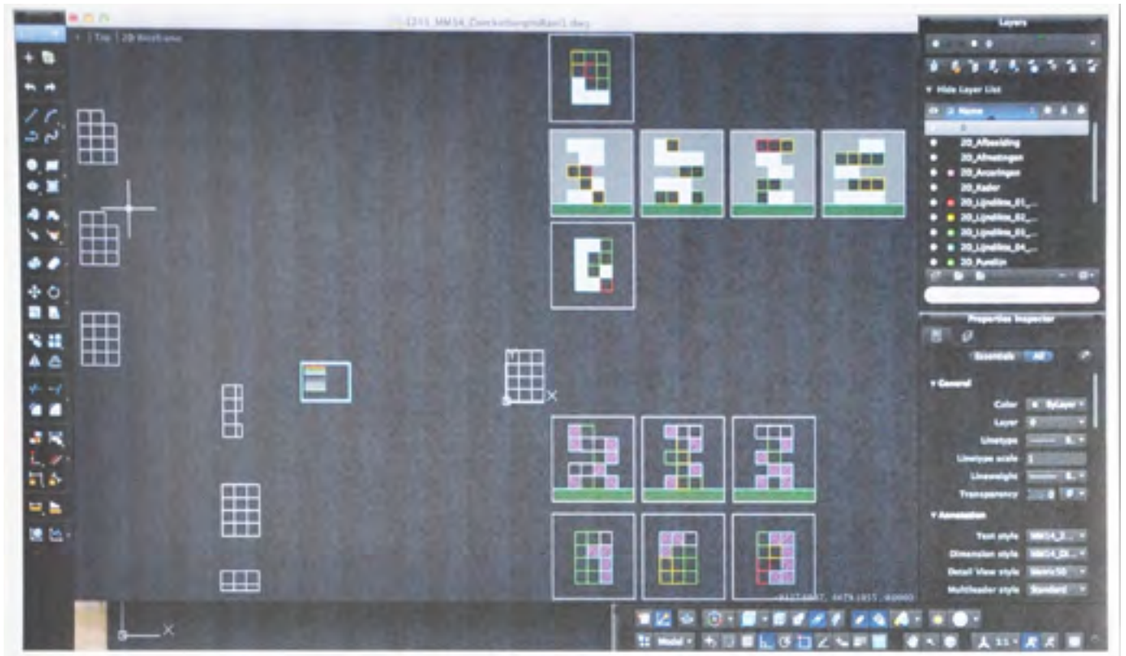
2.2.3 Plotting the Plan

Set your paper space to A3 and leave at least a 2 cm. border/ frame around your drawing. Save your file as 'name_plans' (or something similar).[13] Start by setting out your system lines. The basic grid of our structure is 3m x 3m. Minimum 6, maximum 7 squares long and 3 squares wide. Draw your system lines accurately because they will form the basis of your whole drawing, and consequently your digital model. The system lines are of the line-dash-line type and should not be too thick (± 0,05mm. will do). Create a symbol of the system lines. A symbol (or block) is a combination of elements which are fixed. Changing something in the symbol, will change all the copies of that symbol. Copy the system lines, as a symbol, as many times as you have floors. While you can quickly copy-draw in a sketchy way, scattering the system lines around your virtual paper, try to organise them in a lay-out (if only to save time at the end of the process). Depending on your CAD software you will be drawing on a 1:1 scale or on a predefined scale. For this phase scale 1:200 (1cm. represents 200 cm.) will do perfectly. Alternatively you can draw your system grid as 1,5cm x 1,5cm squares, if you are not sure about how to set scale.

From your physical drawings map the system lines in order to draw the planimetric set: plans, sections, elevations. Use the system lines as a reference and map the alignments of cubes by drawing a cube, a rectangle or a polygon (the elements) on top of the system lines. The lines of the cubes and stairs have the same thickness, or preferably a fraction thicker than the system lines. When you have drawn all the elements on all plans, add a grey tone or a hatch (a line pattern) to these elements. Repeat these actions for the sections and the elevations, using the same conventions as your physical plan set (stairs, section lines, surface levels, labels,...).

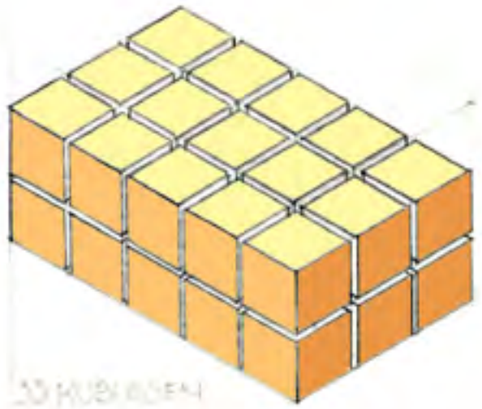


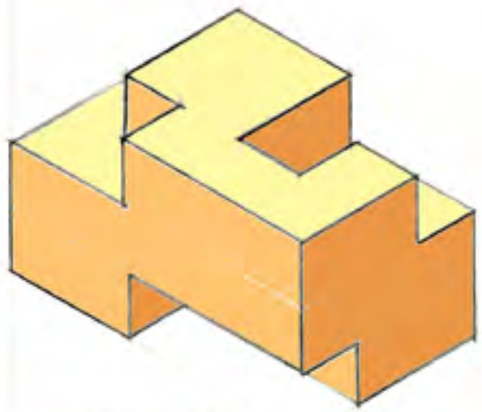
In order to check the outlook of your drawing try to make a first print. The biggest disadvantage of digital drawing drawing is that it uses virtual lines to emulate physical ones (drawing lines with a certain thickness). Printing your drawing from time to time enables you to check whether what you have virtually drawn, is printed as you intended it. Postponing printing can result in disappointments because you did not oversee certain anomalies. Typically hatches are scaled elements which tend to be distorted in print. Colours or tones can also change because of calibration conflicts (what you see on screen does not necessarily correspond to what the printer processes). First of all check whether the drawings correspond to the physical model. If discrepancies occur evaluate them according to their formal and spatial quality and change – either the physical model or the digital representation. Secondly check your line thicknesses, colour tones, hatches and typographical elements (pt. 8 letter size should do). Finally check the composition so that all the drawings are distributed evenly, if only to provide a feeling of tranquility.

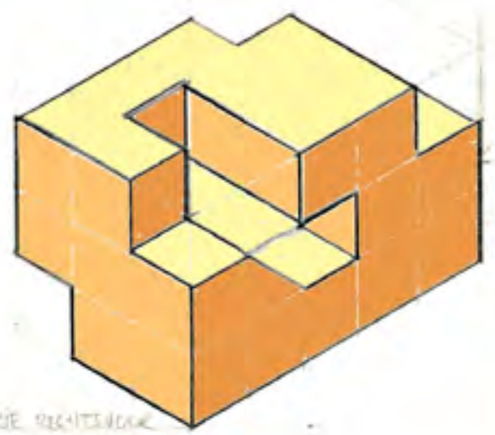


(opposite page) screenshot (Rani Couckelbergs)

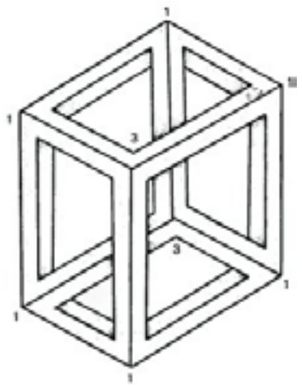
3 parallel perspectives







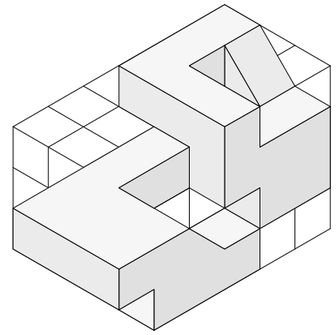
(previous page, author) first exploration of the solid modelling process using an isometric parallel perspective



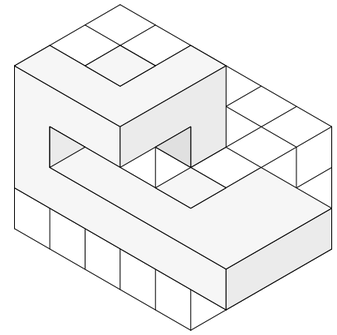
Impossible Cube

Parallel perspectives can be found on Greek vases, Pompeian frescoes, Byzantine mosaics over the Italian Renaissance where they were used to draw measurable structures.[14] Arabian, Chinese and Japanese draughtsmen also used a form of parallel perspective drawing. The introduction of vantage point perspective suppressed parallel perspective only to resurface at the dawn of the 20th century. The historical avant-garde of the early 20th century reintroduced parallel perspectives as a way of escaping the classical and observer dependant vantage point perspective, to visualise the new kind of space the anticipated new society needed.[15]

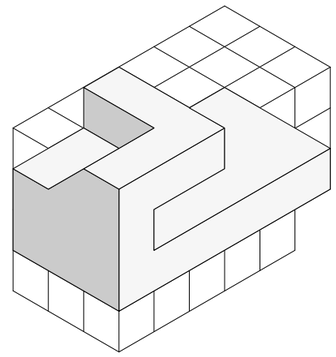
The biggest advantage of parallel perspective is that the drawings retain the parallelism and measurability and provide a three dimensional proof of a structure's functionality and potential to be built. Architects and teachers Ian Fraser and Rod Hemni herald parallel perspectives because they are easy and quick to construct and, as such, allow for rapid visualisation and explication both to the self and others.[16] Parallel perspective visualises three sides of a structure, in one view, in equal measures. Parallel perspectives remain the easiest way to suggest the third dimension in your drawings but they also yield unsolvable overlaps in your drawings. Those overlaps yield optical illusions of the kind Dutch artist M.C. Escher explored to compose his trademark impossible constructions going up and down at the same time.



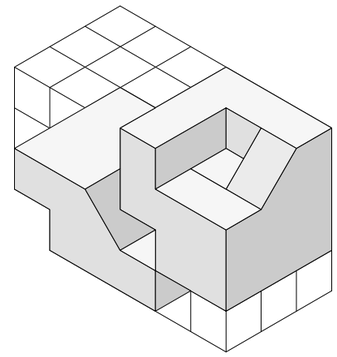
front right isometry



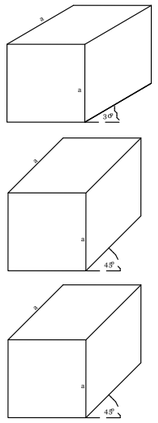
front left isometry



back left isometry



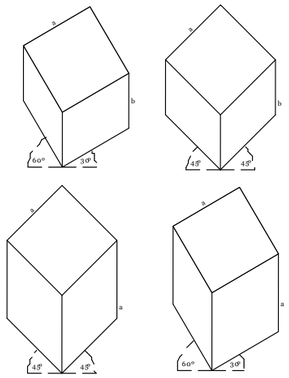
back right isometry



3.1. Oblique Drawings

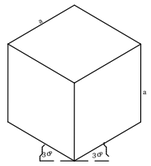
An oblique starts from an orthographic drawing to which you add heights and/or depths. The method can easily be applied to plans, sections and even elevations (respectively, plan oblique, section oblique, elevation oblique). For these kinds of obliques take your structure's plan, section or elevation and extend them on the Z-axis on a 30º or 45º angle (you can also experiment with other angles). To measure the depth you have several options. Draw the full measure on slanted lines, or use half measures to give an impression of foreshortening.

(opposite page) isometric perspective (Laura Reyniers)



3.2. Plan Oblique

To draw a plan oblique you start from the orthographic plan and add heights. You can choose to leave your plan straight and extrude the height obliquely, or rotate the plan to allow for the height to be straight upwards. Again you have several options to measure the heights. Using the actual measure or by using Pythagoras theorem. In our case the plan's sides stand for the long side of the right triangle and the short side becomes it's height. Diminishing its height this way tries to reduce the optical distortion of keeping all measures equal and again gives an an impression of foreshortening. Experiment with the difference between the several options to see which one suits your spatial intentions.



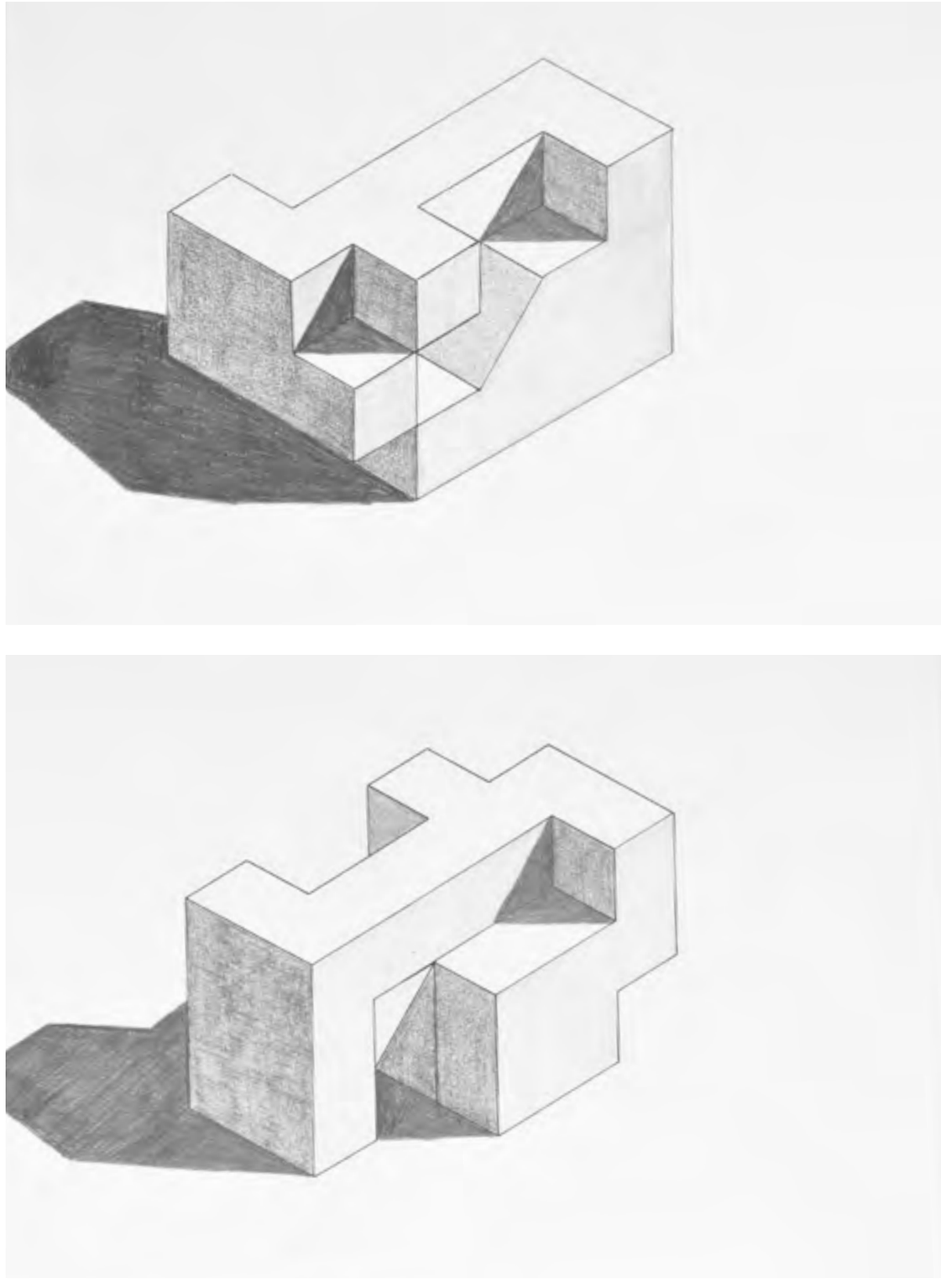
3.3. Isometric Perspective

Since isometric drawings suggest a lower viewpoint they resemble more a perspective view seen from a great distance. To draw an isometric perspective you must redraw the plan using three axes separated by 120º angles. Heights and lengths are measured equally as the plan measures.

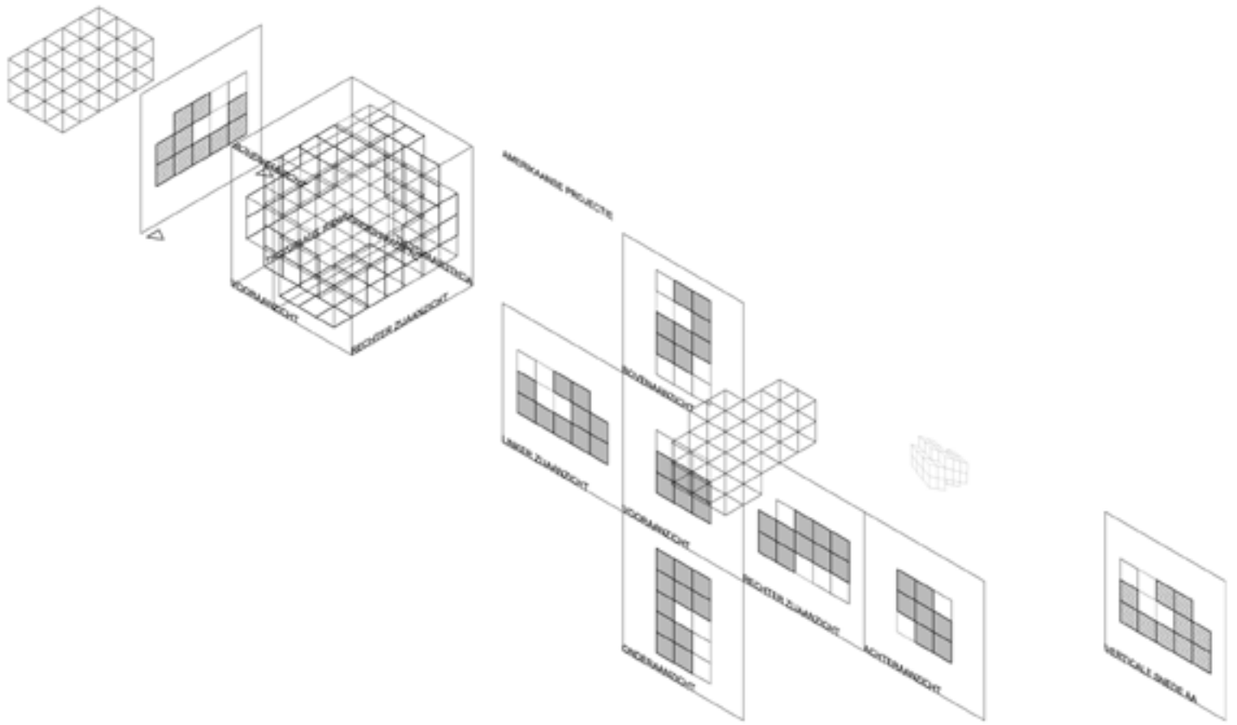
Auguste Choisy (1841-1909)
From l'Art de Bâtir Chez les Romains

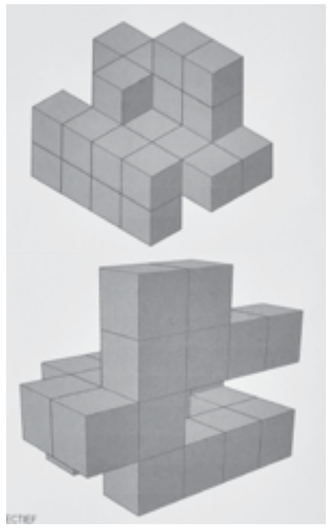
3.4. Up Views

A special breed of parallel perspectives are the worm's eye views, up views or Choisy axonometries named after architectural historian Auguste Choisy (1841-1909). Choisy's 'Historie de l'Architecture' and 'l'Art de Bâtir Chez les Romains' perfected the worm's eye view to illustrate and compare key historical buildings.[17] Where a plan oblique obscures the interior of your structure, up views show the plan and the inside of the structure. These kind of drawings reveal ceilings and soffits in relation to walls instead of the top side of the surfaces such as floors or roofs. Up views can be drawn in any parallel construction.



4 3D modelling I [18]





Exploring 3D modelling (top to bottom) Erika van Houdt; Nicolas Borgerhoff; Clifford Cash Boakye.

(opposite page (left) author: 3D modelling proces; opposite page 'Sketched Upped' 3D model (Robbe Roggemans); next pages (author) modelling process

Save your file as '*something*_3D' before your start processing the 3D model. Doing so will keep a planimetric version of your structure as a separate file to refer back to and the new file can be used as a playground for your drawings without worrying to damage the original. To process the 3D model you only need the plans so you can save the sections and elevations on a separate layer. The plans will be used to extrude your drawn structure. Up until now your drawings were flat, extrusion means as much as adding an extra dimension to the squares which define your structure in the plan. For convenience define a distinctive line colour for the stairs, as you will have to model the stairs separately. As the virtual 3D-model provides new vantage points to study your structure, building and processing a 3D-model will add a new layer of possibilities to your formal and spatial thinking. It will provide you with opportunities to reposition certain constellations and, as such, redesigning them.

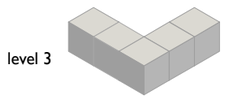
Define a new layer in your application, name it 'something_3D' in order to keep your drawing organised. Draw six squares upon your basic system lines and draw a square over the platform at the back of your model. Extrude these elements by 3m. This models one layer of cubes. Now extrude the 15 cubes of the first floor, and another 9 on the second. You can use the copy function in order to avoid having to redraw the cubes on every level. Make sure to only copy cubes (not the lines) and check the alignment of cubes for unnecessary overlaps (which would distort your digital model).

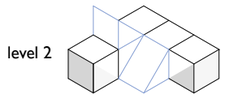
Remove the cubes defining your passageway. Position them somewhere on the side of your first floor. Now do the same for the second floor and finally reposition the residual cubes on the positions you envisioned within your model. Study the alignment, make modifications, if necessary. Only work with the virtual cubes and do not forget to save your file from time to time.

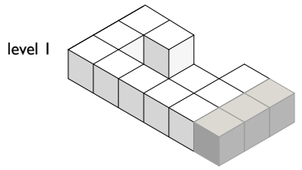
Change the view setting from top view to front or side view. You will see that all elements are positioned along the surface line. Select the elements of the first floor and move them 3m upwards, those of the second storey 6m, third one 9m, and so on. For convenience you can group them (as it makes selection easier). Now switch back to top view and stack them by moving them horizontally. You can move them by gripping them by using the cursor or by using the move command. The latter will be more precise considering you positioned the elements on equal metric distances from each other. Finally select a stairway cube and switch to its side view, that is the view which should display its slope. Draw an equal triangle of 3m and extrude it by three metres.[20] Put the stairs in their right places and do not forget to position them at their respective heights.

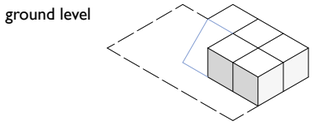
Check your 3D views (top, bottom, front, side, isometric, ...) to see whether your virtual stacking is accurate or not. If all cubes are aligned such that they conform to your physical model you have succeeded in building your first digital model. Now explore your model using the different view settings.

If all went well you now possess all floors modelled by individual cubes and their stairways. Remove all redundant drawing elements (plans and other leftovers) from your drawing and reposition the virtual model to the centre of your page. Switch to top view and draw a large square rectangle around your model, this will be the basis for your virtual model. Extrude the rectangle a few centimetres and switch to front view. You will now see that your cubes are sunken into their basis. To avoid blurring of lines lift your ground plan the same amount of centimetres so that their baseline corresponds with the top of the basis.





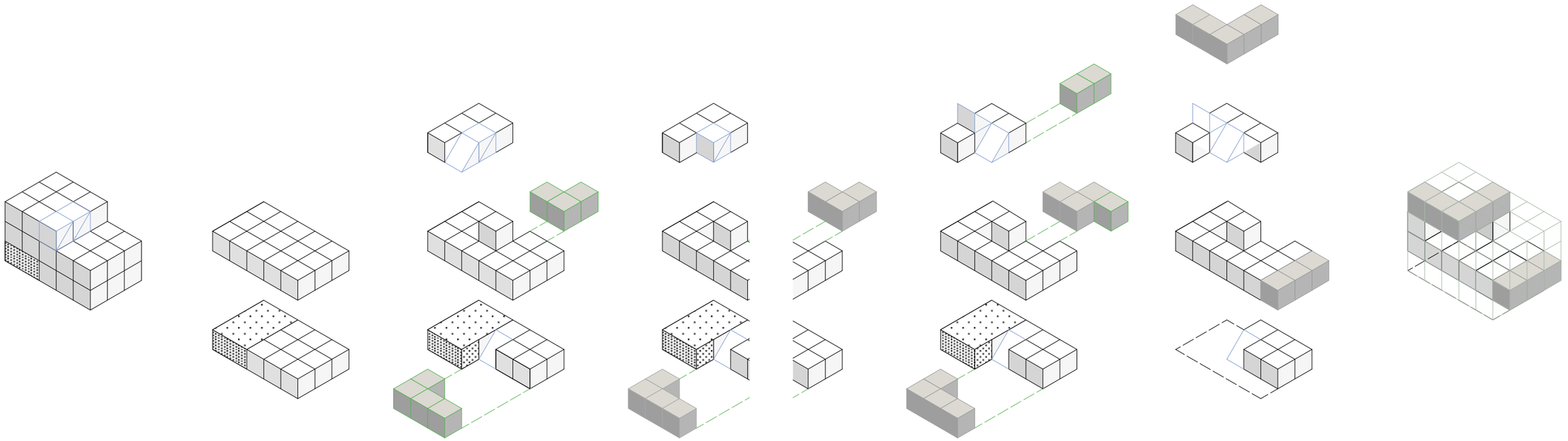




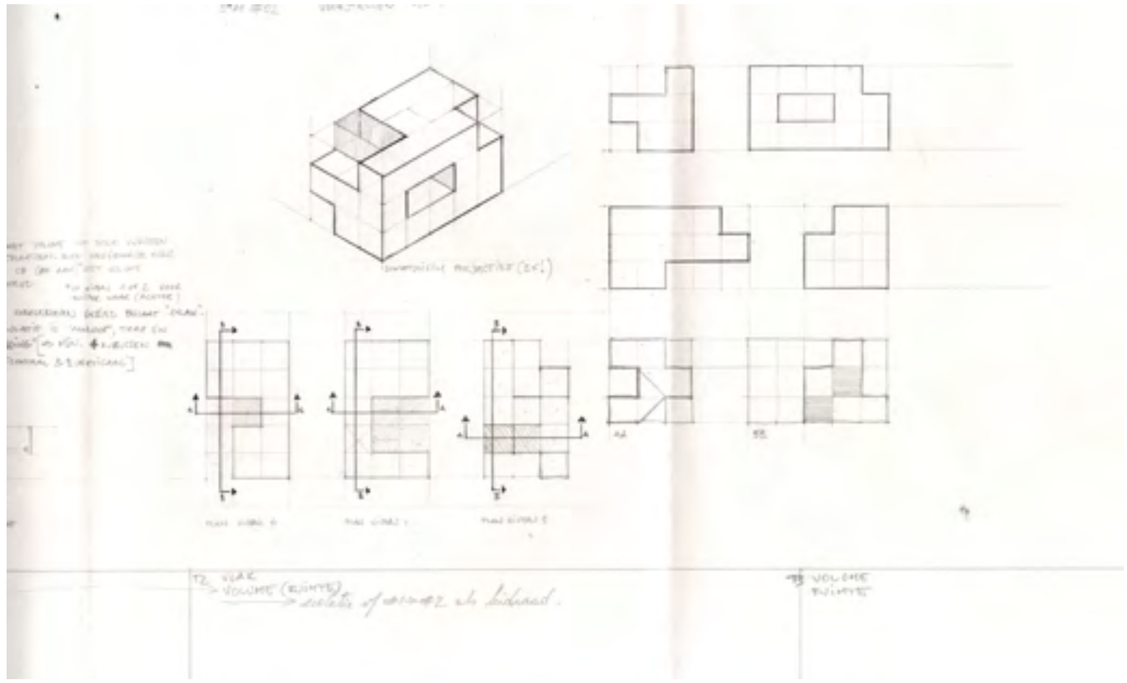
An exploded view will conclude this first phase. You know how to read exploded views from an array of toys you may have played around with, or from a certain Swedish furniture company's construction manuals or even from technical explanations of car parts or electronic devices.

Exploded views layer information on top of each other to reveal relationships between the different parts. For buildings exploded views are used to reveal the relationship between the different floors or to explain the construction of parts and details. Copy the 3D model into a new layer and set the visibility to this layer solely. Switch to front view and select the model from the first floor upwards. Move the floors 4m or even more. Now select the structure from the second floor upwards and move the remaining floors to an equal distance as the previous move. Repeat this step until all floors have been moved. Now switch to a parallel perspective view (axonometric, isometric,...). The floors should be aligned vertically, drawn apart to reveal their superposition. Exploded views three-dimensionally visualise the relation between the different floors making up your model or structure.

'Sketched Upped' 3D model (Robbe Roggemans)



interlude: collaging a first presention



Isaura Doumen (model photos)

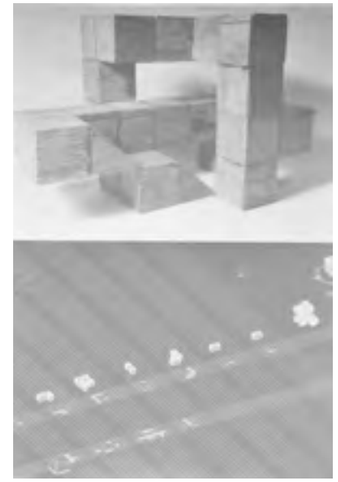
Build a studio situation. white floor, white background and position your model in that situation. Direct a light source onto your model and study the shades and shadows. The light source represents the sun shining down on your structure. Be aware that your best light source will be the actual sun. Whichever you choose (a spot or the sun) adapt your studio setup in order to avoid unwanted shadows from the setup.[5] Study your model by turning it around. See how the light penetrates the different areas of your structure and photograph the most interesting views and lighting effects. Try moving one or more cubes to enable the sun to penetrate certain areas. Re-assess and reconfigure your model based upon the lighting information. Do not be afraid to change the model, allowing light entering your modelling will open up your structure and heighten the ambient quality of the spaces.

When you have decided upon a certain position for the light source and consequently your model photograph the elevations and a top view using the same light position in each photograph, again against a white background, which is positioned in such a way not to cast any unwanted shadows upon your model. Print the elevations, top view and a selection some perspective views on two sheets of A3 quality paper (140 grammes or more). Compose the frames.

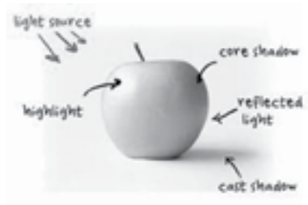
Using a print or a copy of your original plans alter the areas which changed based upon the lighting effects. Also change the positioning of the cubes within your digital models. Mix and match a presentation consisting of plans, sections, elevations, exploded view and a parallel perspective presentation which reveal the three dimensionality of the structure, select them from all the drawings you have allready explored. The structure will be presented on an A2 sheet of paper, or two sheets of A3 glued together. You can choose to work digitally or physically. The quickest way to process the physical version is by using tracing paper, preferably a heavier quality than ordinary sketching paper. Digitally you can proceed within the CAD software. Organise all your drawings on a 1/300 scale (1cm equals 3cm, which is the scale you used to process your physical plans) and compose them in a legible manner. Generally a presentation starts with plans, moves over to sections over elevations to end in perspective representations. Look for a harmonic way to order these elements. In choosing your drawing elements you can combine, mix and match digital and physical sources, either by scanning and importing or by printing, cutting and pasting.

Copy or print the presentation on high quality paper (140 grammes or more). Fill in the walls with a dark - or even black tone to discern solid or void. In the plans and sections, 'cut' elements are rendered by using the same hatch. Add a tone, or colour to your floor areas to discern inside from outside. Add colour to the elevations and the outside areas of your exploded view as well as the parallel perspectives. Return to your photographs and replicate the shadow effects as seen on the photographs on your elevations, exploded view and parallel perspectives. Based upon the photographs and the previous tonal variation you used in your plans and sections add tone to the sections.

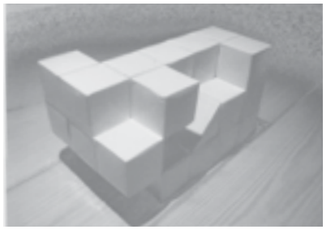
On the sections and elevations add abstracted human figures, their height a little smaller than 2/3^{rds} of a cube. Not one but several. Finally add some trees to your sections and elevations. Draw a tree in front elevation based upon a tree somewhere near you or look for a good photograph of tree which you can trace or copy. Make sure the trees are collaged behind your sections, that they do not obscure your section, as doing so would imply that a tree grows in your structure (which is possible but would imply that you draw the top view of that tree in your plans).



Combining a photograph with a screenshot, (Anton Parys)



The opposite of light is shadow; shadow cannot happen without light. Through the interplay of light and shadow a drawing will become fuller and give the illusion of relief. We can look at shadow as a material that can be painted, making surfaces and planes stand out. Shadow is not something one depicts; it is something with which one depicts. That is you create light on white paper by creating a shadow. Shadows are cast by objects through the interception of light on the ground plane or background. In full sunlight shadows are sharper and more distinct; on overcast days their edges are softer. Light projected on an object will cast a shadow on the plane on which the object rests. The area of the object opposite the light source is shaded. The cast shadow generally appears darker than the shaded side of the object and the shadow is darkest along its leading edge. The boundary between shade and shadow is called shaded edge. The shadow will also reflect the form of the object that is casting the shadow, and will always follow the contours of the ground plane. In drawing composition, shade and shadow can be used in many possible combinations: as a silhouette, as a frame for different shapes, or to define the picture plane.[21]



(above) using photographs to study light and shade, (opposite page, author) hatch studies

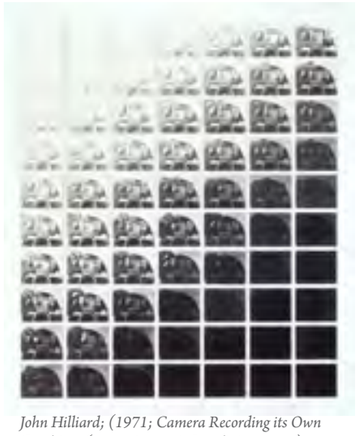
Toning and Texture Studies

Toning and textures enliven your drawings, add an extra dimension to, otherwise, flat drawings. There are unlimited ways of toning. Explore different techniques and movements to tone and/or hatch your drawings in order to search for your favourite approaches. You can use your pencil, a pen, charcoal, watercolour, paint, ... Chip Sullivan advises to judge tones by looking around you, as a way to develop your powers of observation by studying innate natural tones and their effects on your surroundings. Squinting when looking at the subject will help you to see tones. Paul Laseau advises to do toning exercises when you feel tense or hesitant, try overcoming these barriers by engaging a whole sheet of paper with tonal rudiments.[22]

Before beginning a drawing always note where the light is coming from. Determine its point of origin, and place yourself in reference to the light. Exploiting the light will illuminate your architectural and environmental drawings and bring out the third dimension. By carefully distributing the light you can achieve the feeling of emotion in your drawing. Work out the composition of your drawing using light construction lines, starting with the light areas and then adding the shades. The source and quality of the light will affect your grey tones. Light can be used to create highlights that lead the eye to certain points, or as a focus, to create areas of emphasis. When light is used in combination with tone it can produce a sense of volume.

Texture combined with tone creates pictorial space. Your environment contains an endless variety of textures; this is one of the characteristics that defines buildings and landscapes. Every element in the environment has some degree of texture, and these textures must be reflected in the drawing. Texture is about touch. Unless we can touch the texture we are rendering we must rely on our eyes to interpret it for us. A drawing should express the emotion of a tactile experience. The artist may mix the media of strongly textured materials with drawn representations of textures. The cubist painters Braque and Picasso, and Gris were some of the first artists to incorporate newspaper ads, wallpaper samples, stamps and so on in their work to evoke textural interest in the flat surface of the canvas. Experiment with real textures in your work.

Chip Sullivan offers the following experiment to understand light quality. On a clear day get up before dawn, and from a fixed, comfortable viewing station such as a large window, a porch or hillside, spend the day until twilight observing how the landscape and architecture is affected by the changing light. Develop an awareness of how the mood changes as the light passes. Follow the angle of the shadows and the glint of light, and the juxtaposition of light and shadows. Record your thoughts and observations in your daybook, photograph the scenery in time lapses.[24]



John Hilliard; (1971; Camera Recording its Own Condition (7 Apertures, 10 Speeds, 2 Mirrors)

Physical Toning

Horizontally, draw five centimetre squares across the top of the page. Repeat the rows all the way down the page. In each row use different shading methods to create a series of tones in gradations from black in the first box, to white in the last box on the right. Use a different tool for each row and discover their differences. Do a row in a HB pencil, a 6B pencil, in pen and ink, soft charcoal, ... Be inventive explore different media and their effects. On a different page try to convey smooth tone variations, as observed on cylindrical and round objects. The object is the practice smooth, even tones from light to dark. Draw a series of 5cm by 35cm rectangles. In each box lay down your tone as smoothly as possible with closely spaced parallel strokes, working from light to dark. You can use a kneaded eraser and a paper stump to rub down the lines so that they become more smooth and almost imperceptible. Alternate light-to-dark rectangles with dark to light ones. Again try different media such as pencil, charcoal, pen and ink...

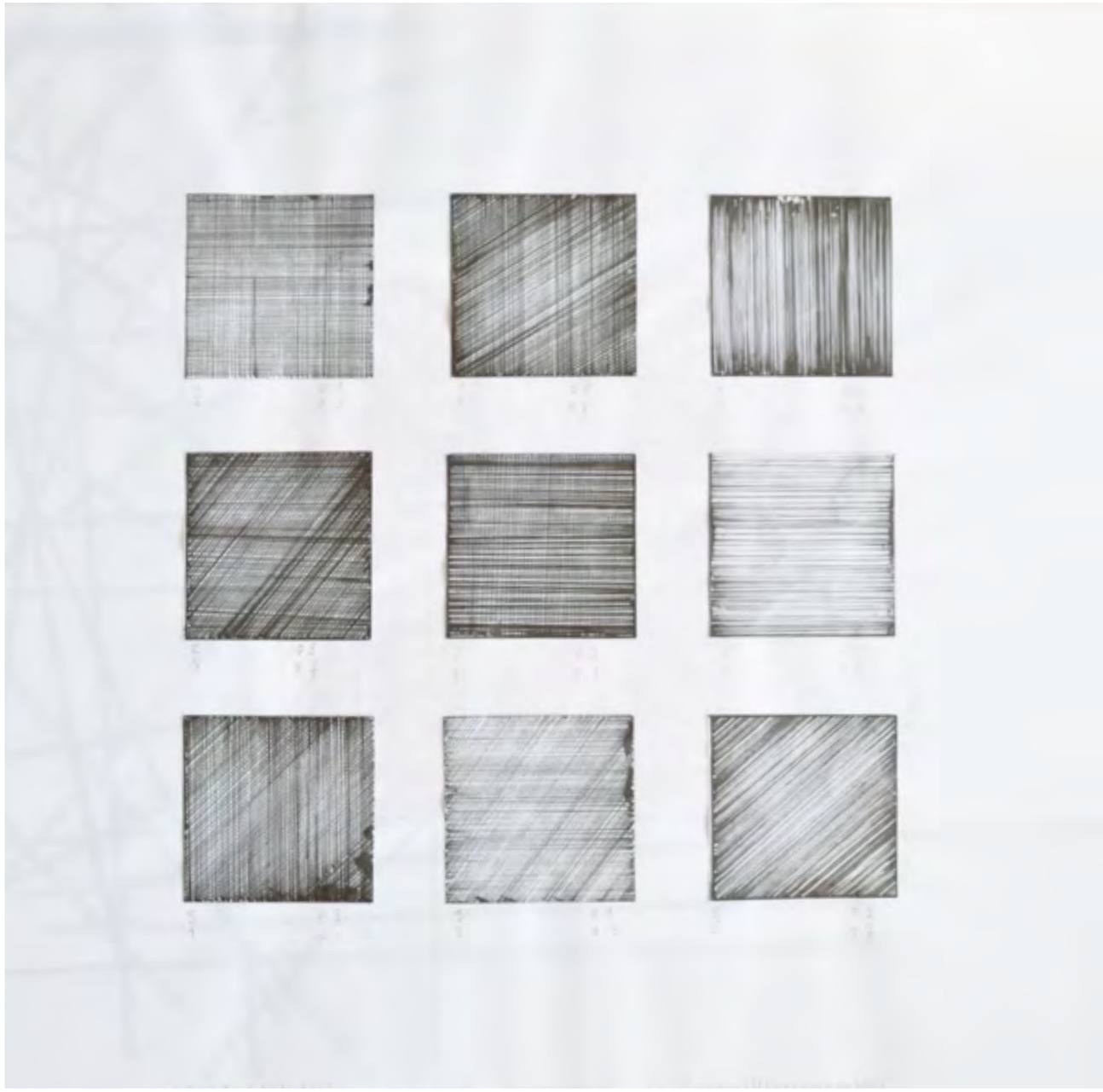
Digital Hatches

Hatching is a simple drawing convention that can give the effect of tone and value with pen and ink. In architectural drawing hatching is used in two ways: as a way to render tonal variations and as a way to indicate building materials. In plans and sections brickwork has a different hatch than concrete or insulation. The following exercises can be considered as hatching rudiments which can enliven your drawings. They are able to increase the expressive quality of line and produce texture. *Hatchures* are short parallel strokes repeated in patterns. By controlling the variety and intensity of the hatching, tones will appear dark or pale. The closer the spacing of the lines the darker the effect. For added character *hatchures* can be slightly curved or placed at different angles. Cross hatching is a variation of hatching, but can produce a wider range of tonalities. To create cross-hatching draw a series of short parallel lines. At right angles draw a series of overlapping parallel lines. Keep repeating this process by overlapping the hatched lines at a slightly different angle each time until you produce almost total blackness. In digital drawing there are two ways of drawing hatches. You can use standard hatches provided by your drawing application. To explore hatches I would like to invite to explore them by using the mouse, trackpad, fingers upon a tablet or pressure sensitive pen.

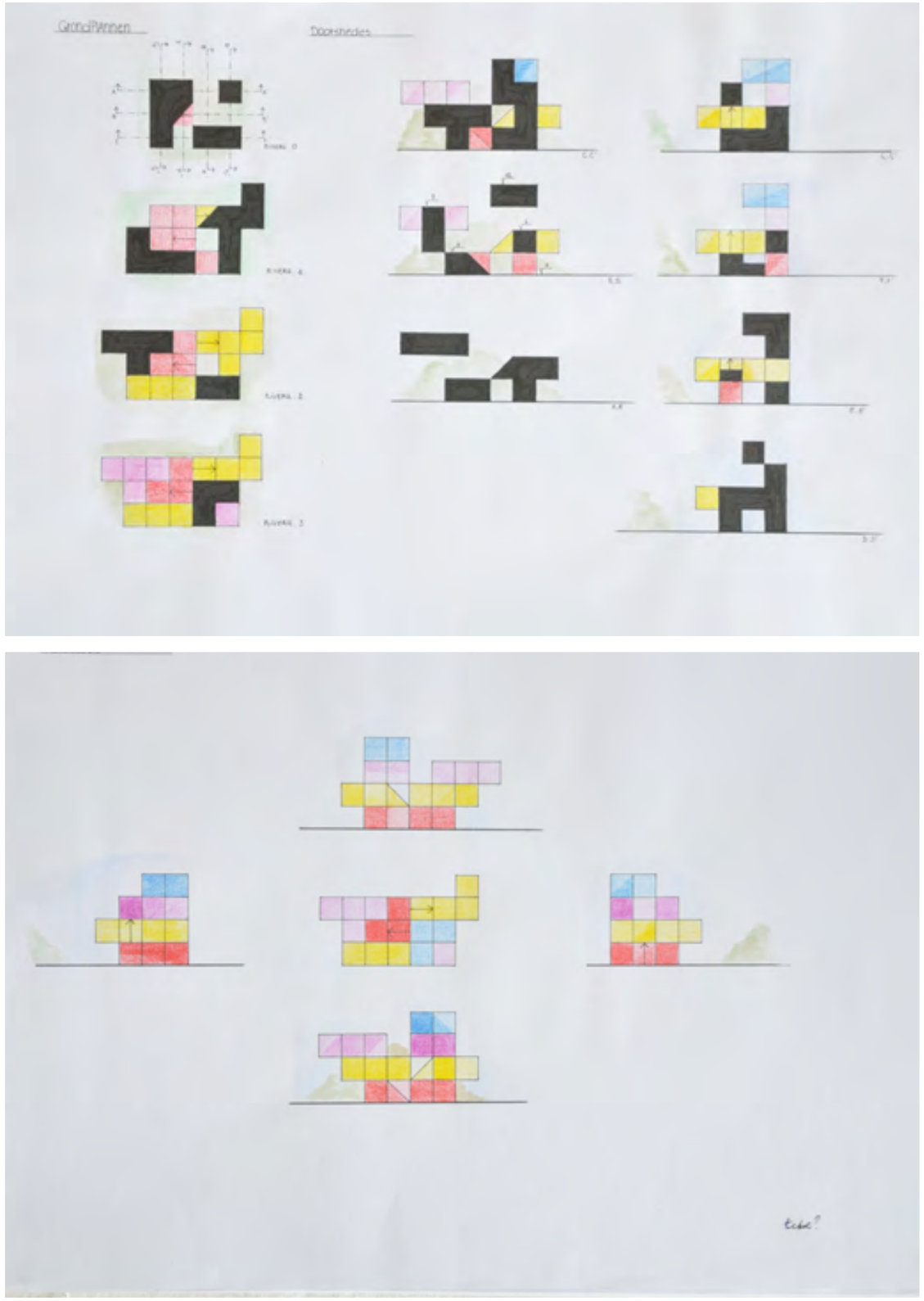
Draw a series of 5cm by 40cm boxes and practice cross hatching from light tones to black. Start with a single hatch all over which sets a ground tone and then add layers to add tone. Vary the type of strokes you use, including slightly curving and arching strokes, and strokes in different directions. On a new sheet draw a series of five by forty centimetre rectangular boxes. In these boxes experiment in tone with short hatched lines, starting with loosely spaced parallel lines then gradually increasing their density until they become almost black. Use a different line in each box.[24]

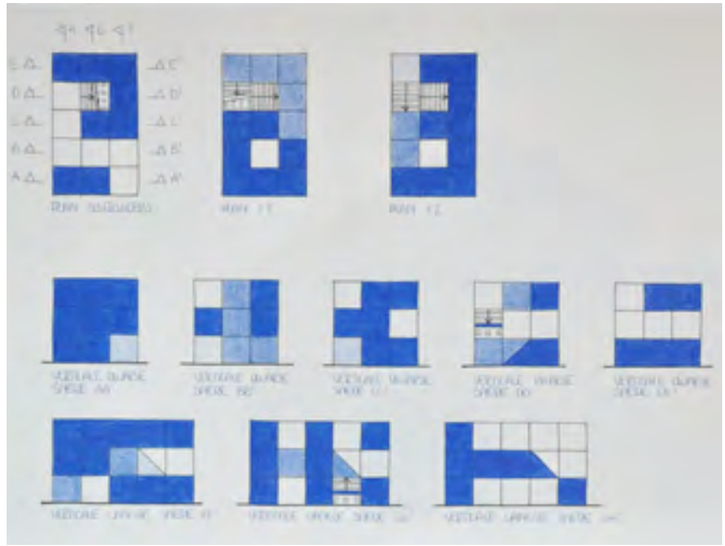
Collaged Tones

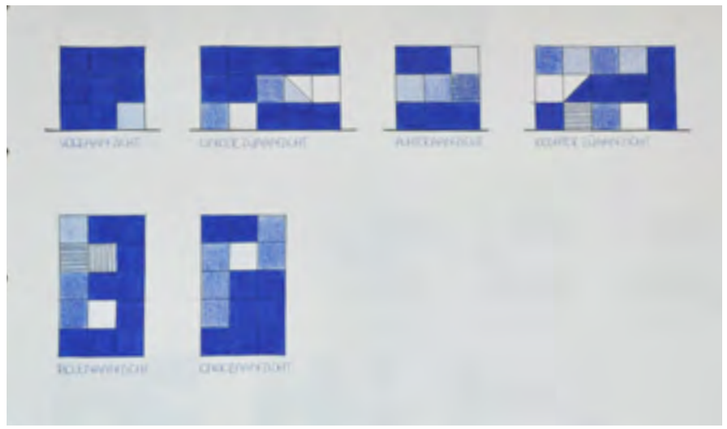
In order to draw textures it is important to first feel them. Find five contrasting flat textures (photographs); cut them into five by five centimetres squares and mount them on one side of the page. Cut three by forty centimetres strips from newspapers, magazines, or other printed media, staying with black and white because this will enhance the textures. You can also use photocopied material. Glue them down parallel to one another, and observe the effect of the contrasting textures. Try different versions proceeding from light to dark.

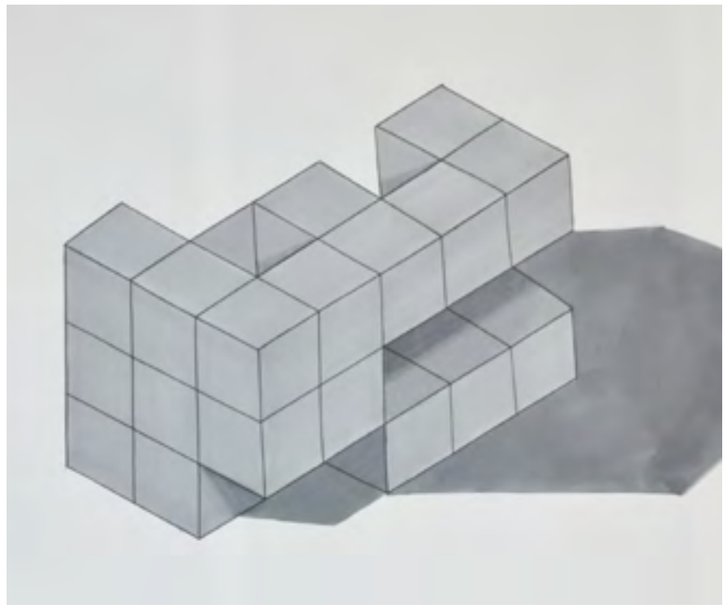


(opposite page) Naomi Schrauwen



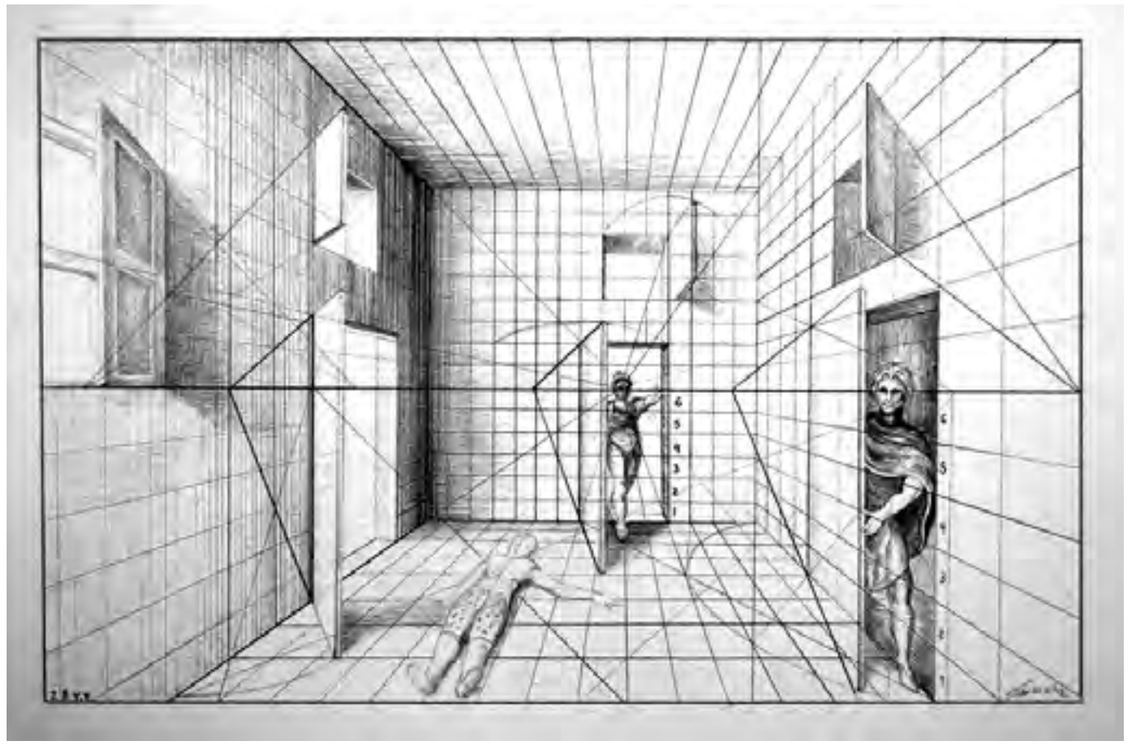




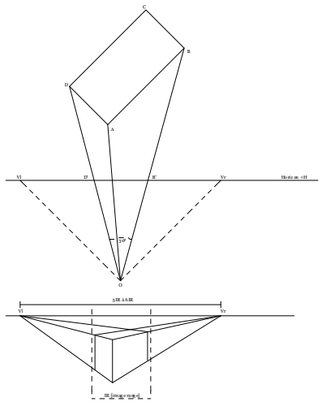


Constructing a first presentation based on transfers of the digital files (left) Fred Meeuwens; (right) reworked orthographic drawings and toned isometric perspective: Davina Decoster

5 **perspective drawing I**



(previous page) Hans Vredeman de Vries: interior perspective grid (note the DvP is located quite close, yielding distortions towards the front of the drawing)

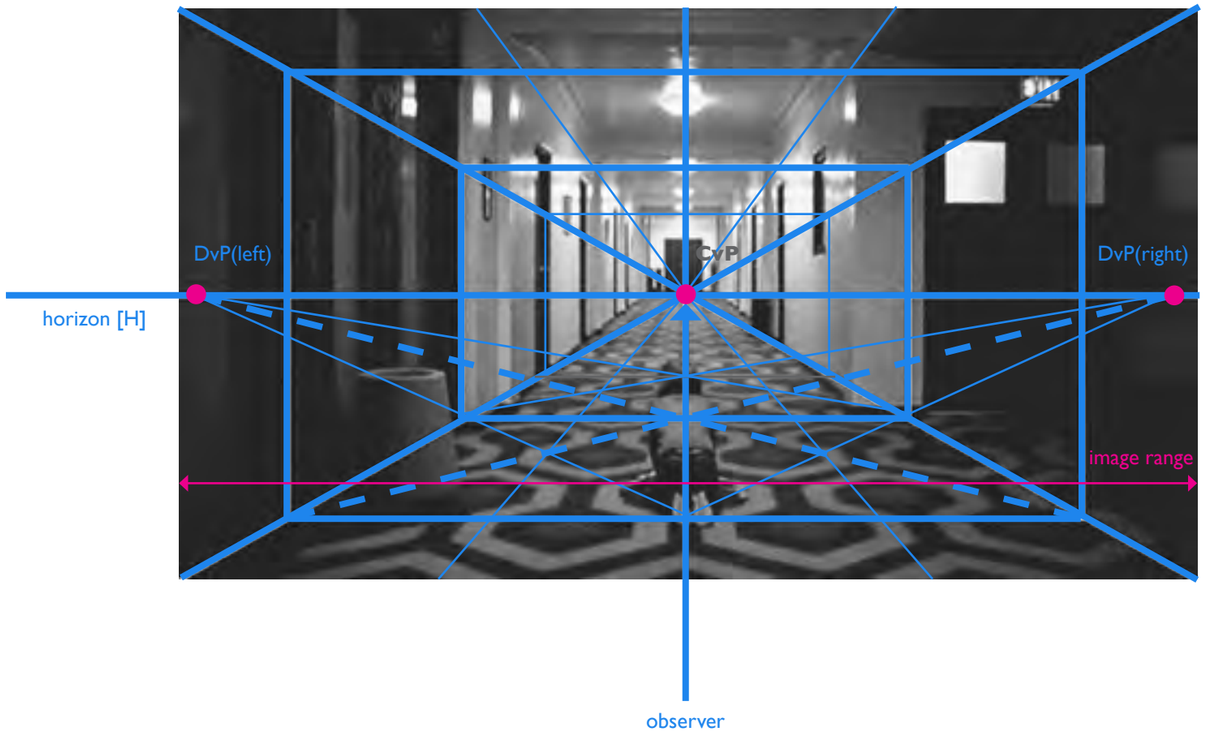


Drawing buildings in linear perspective engages a viewer by means of the vantage point of the draughtsman. Geometrical linear perspective is based upon projection of a scene onto a flat surface from a specific point of view. This way of constructing perspective can be time consuming and has become, especially through the development of 3D modelling, a rather obsolete way of depicting form and space. The techniques offered here make use of a set of rules of thumb providing quick paths to draw your structure to proportion.

Linear perspective is a mathematical way of imagining objects in space which is based upon a set geometric rules. Because of its mathematical foundations the framework makes extensive use of the cube as organising body. As the illustrious F.A.M. remarked: '(...) *a cube remains a cube characterised by its equal sides. An apple or a leaf can never become specific, it will resemble an apple but it is impossible to check whether the picture represents this or that apple.*[25] What F.A.M. is trying to say is that in order to learn how to draw it might help to use controllable elements, it makes it easier for the student to check whether what (s)he has drawn is accurate or not.

Linear perspective tends to break everything up into geometric bodies (cube, cylinder, pyramid, beam, ellips, ...). Drawings add up by measuring and calculating their proportions relative to each other. More often than not the structuring element is the square and the cube, the very reason MWMWI revolves around the modelling of a cuboid architectural model. Your unique architectural structure will be used to introduce the basics of linear perspective sketching and explore both the exterior and the interior (based on your circulation route). There are three types of linear perspective: One-Point, Two-Point and Three-Point perspectives. While the latter comes closest to reality we will use the former two the most because they are more easy to draw and read.

Some notes on terminology and constructing a perspective. Linear perspective depends on a vantage point, your position that is. The vantage point always is related to the horizon line (the eyelevel of the draughtsman) upon which one or two vanishing points are positioned. These elements structure a drawing. The horizon divides the drawing horizontally. Try to avoid to position your horizon in the middle of your drawing, unless you are exploring, symmetrical, Wes Anderson or Stanley Kubrick compositions.[26] Raising or lowering the horizon line provide space to focus on landscape (higher horizons) or atmosphere (lower horizons)). The combination of your vantage point and the vanishing points yields foreshortening, the illusion that, as you go deeper, the elements become shorter. Foreshortening combined with shades and shadows provides a sense of depth.



Stanley Kubrick, Schematic scene from 'The Shining', use of central (symmetrical) perspective as illustrated by video essayist Kogonada (see note 2). The schema illustrates the perspective grid of a one-point perspective. The schema introduces the key features of perspective construction: Horizon [H], Central Vanishing Point [CvP], Image Range [IR], Diagonal Vantage points [DvP(left) and DvP(right)] and picture plane.

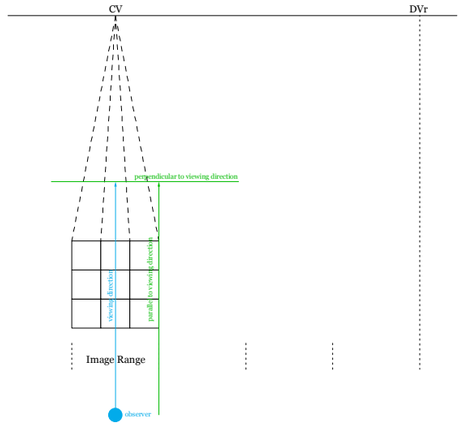
5.1 One-Point Perspective (introduction)

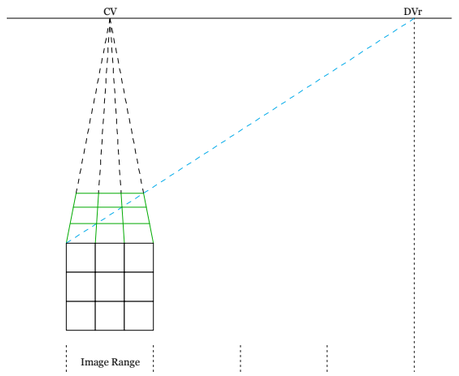
One point perspective is generally used for interior studies or situations with a strong axial organisation like streets, boulevards, rows of trees and so on. Its major advantage is its uncomplicated construction as the drawing is distinguished by its single vanishing point and by the way that one set of horizontal and vertical lines remains parallel to a rectangular frame, establishing a formal similarity between perspective and frame. The major advantage of one-point perspective is that it can be constructed departing from an orthogonal plan, section or elevation as the planes perpendicular to the viewer, while diminishing in size, remain equally proportioned.

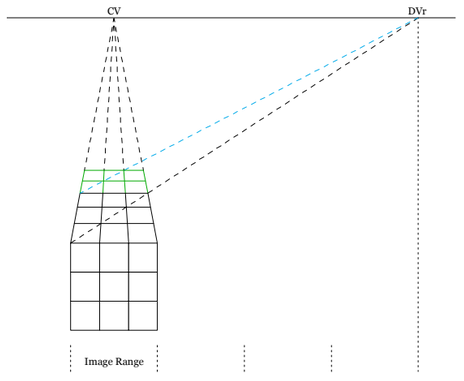
Take an A3 sheet of paper and draw the front elevation of your structure. Within One-Point Perspective the elements perpendicular to your line of sight keep their proportions. Connect the top three squares with your (Central) Vanishing Point (CvP). Now position a Diagonal Vanishing point (DvP) at two-and-half to three times the width of your image upon your horizon line to the left or to the right. Less than two-and-half times yields disproportional foreshortening, more then three times yields flatter perspective planes which make construction more difficult.

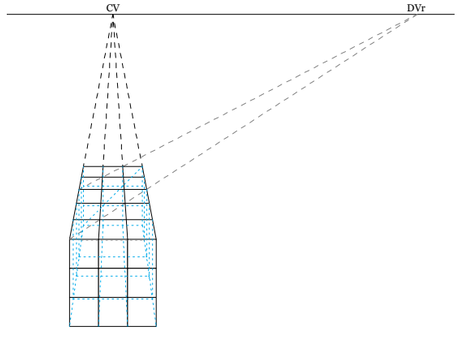
Connect the top side of the square which is positioned on the opposite side of the DvP with the DvP. Where this diagonal line crosses the lines connected to your CvP you will obtain information about the (foreshortened) depth. After you outlined the first perspective square use the furthest corner to repeat the former steps. Doing so defines a structure of three cubes wide and six cubes deep which will figure as the basic structure to draw the spatial framework of your structure, its perspective grid. From that grid you can new deduct the spatial constellation of your architectural structure.

Remember that the width and height of each square perpendicular to you keeps its proportions. An extra cube on top of your model is obtained by extending the heights of the square below the cube you are about to draw. You can also extend one rib and obtain the rest of the cube by transposing the information using the VP and the extension of the ribs of the squares below. Extra row of cubes in the front - or back can be obtained by diagonalising squares in the perspective planes. Study your model's front elevation and align the squares which make up your front elevation. The same method can be used to draw a one-point perspective of the long side of the structure.

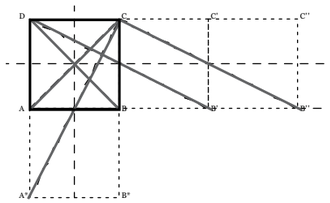


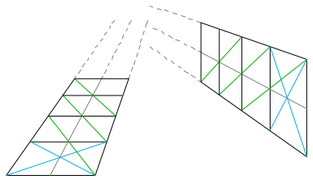




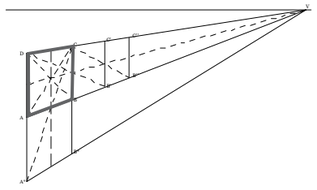


5.2 Foreshortening

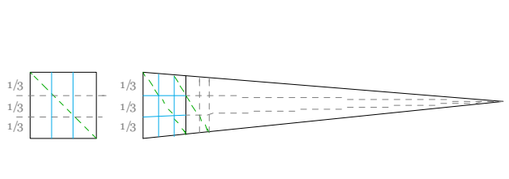




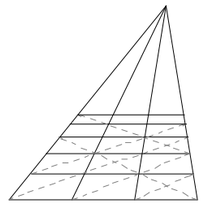
(above) Constructing perspective drawings uses basic geometric principles to multiply elements. Consider the square as given, this could be a portion of your structure or the defining cube to be subdivided into your structure. In order to calculate the next cube to the right or below you have to divide the squares in four quarters from the diagonals. In order to calculate a second cube, equal in size, extend the top or bottom rib of the square. From the top or bottom end draw a sloping line which passes through the centre point of the rib on the opposite side. The crossing of the sloped line and the extended rib equals the length of the square above or to the side. Internalise this principle as it will be used extensively during many of the perspective drawings to calculate positions.

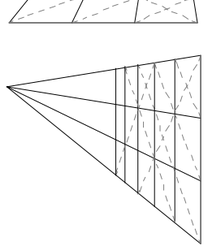


This drawing shows the same principle in a perspective drawing. From the diagonals you extend the cubes following their extended ribs. (above) Multiplying squares by diagonalisation. From the top corners connect the square with the (central) vanishing point. The blue diagonal lines circumscribe the perspective centre of the square. Connecting that centre with the (central) vanishing point splits the square in two (perspective) halves. The green line connects a top corner of the perspective square with the bottom centre of the square. Extend that line until you cross the line extending from the opposite corner towards the (central) vanishing point. From that point draw a horizontal line. This line delineates the foreshortened version of the previous square. Repeat this step as many times as you need squares. The crossing points of the diagonals and the parallels provide the depth of the foreshortened squares. Extending the green lines towards the horizon provides the left and right diagonal vanishing points which we can use to gauge and draw depths.

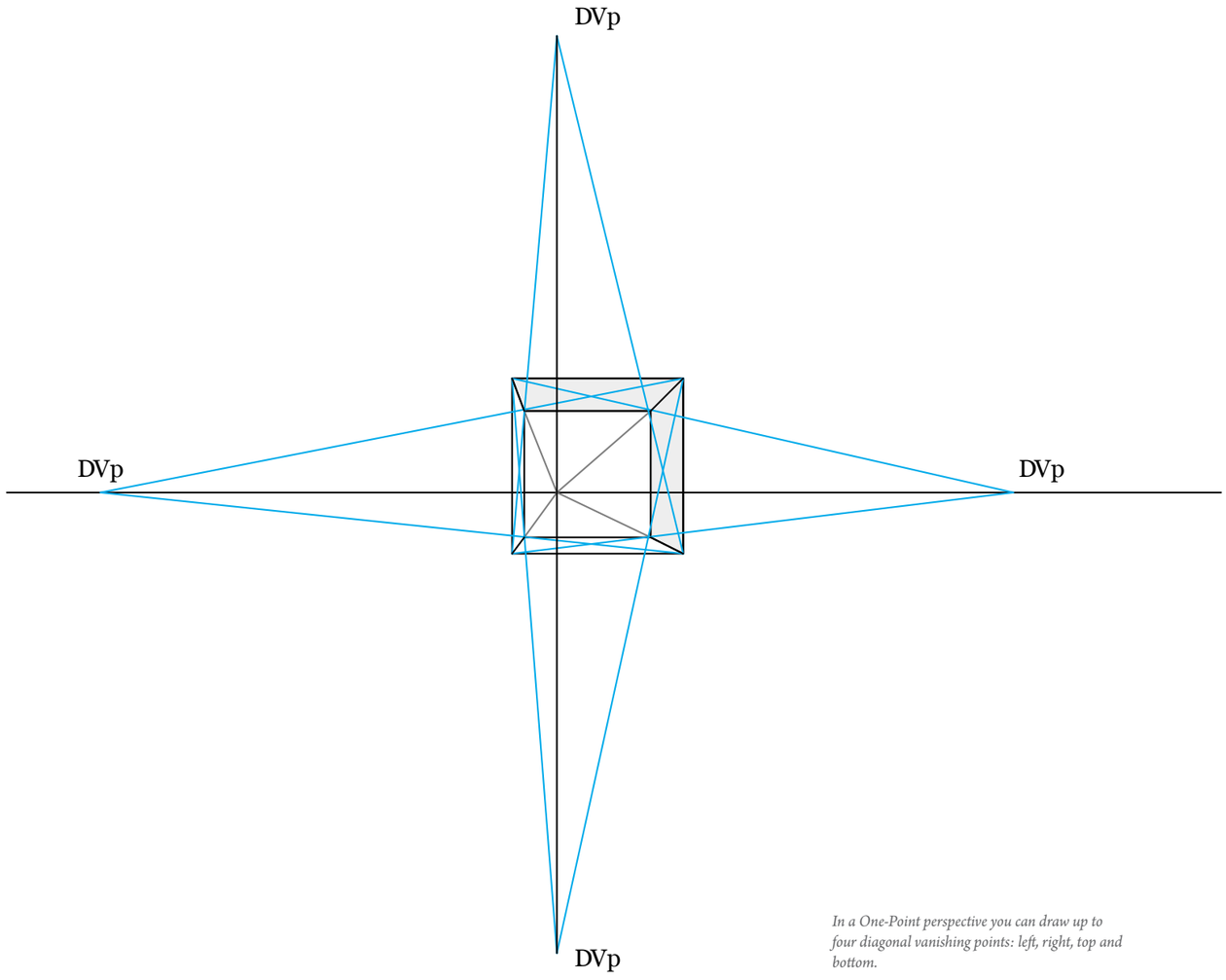


(above) Dividing a square in three equal parts. Frontally (left), perspectively (right) and multiplying the individual squares in order to discern the foreshortening.

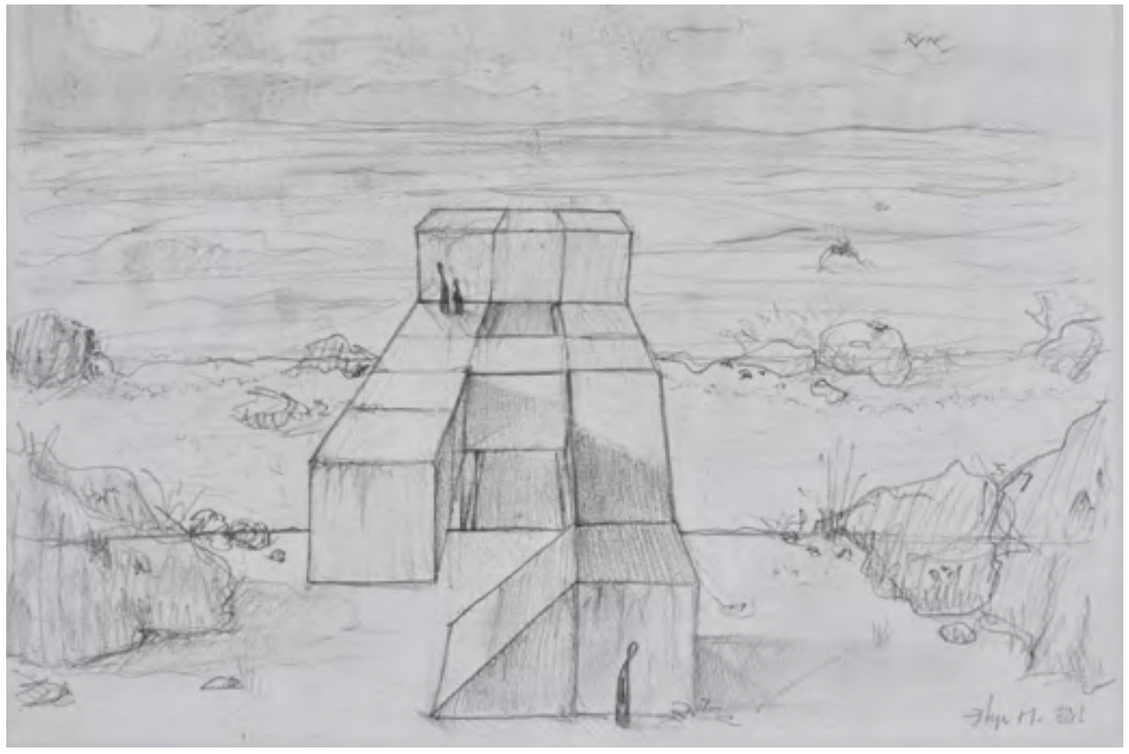


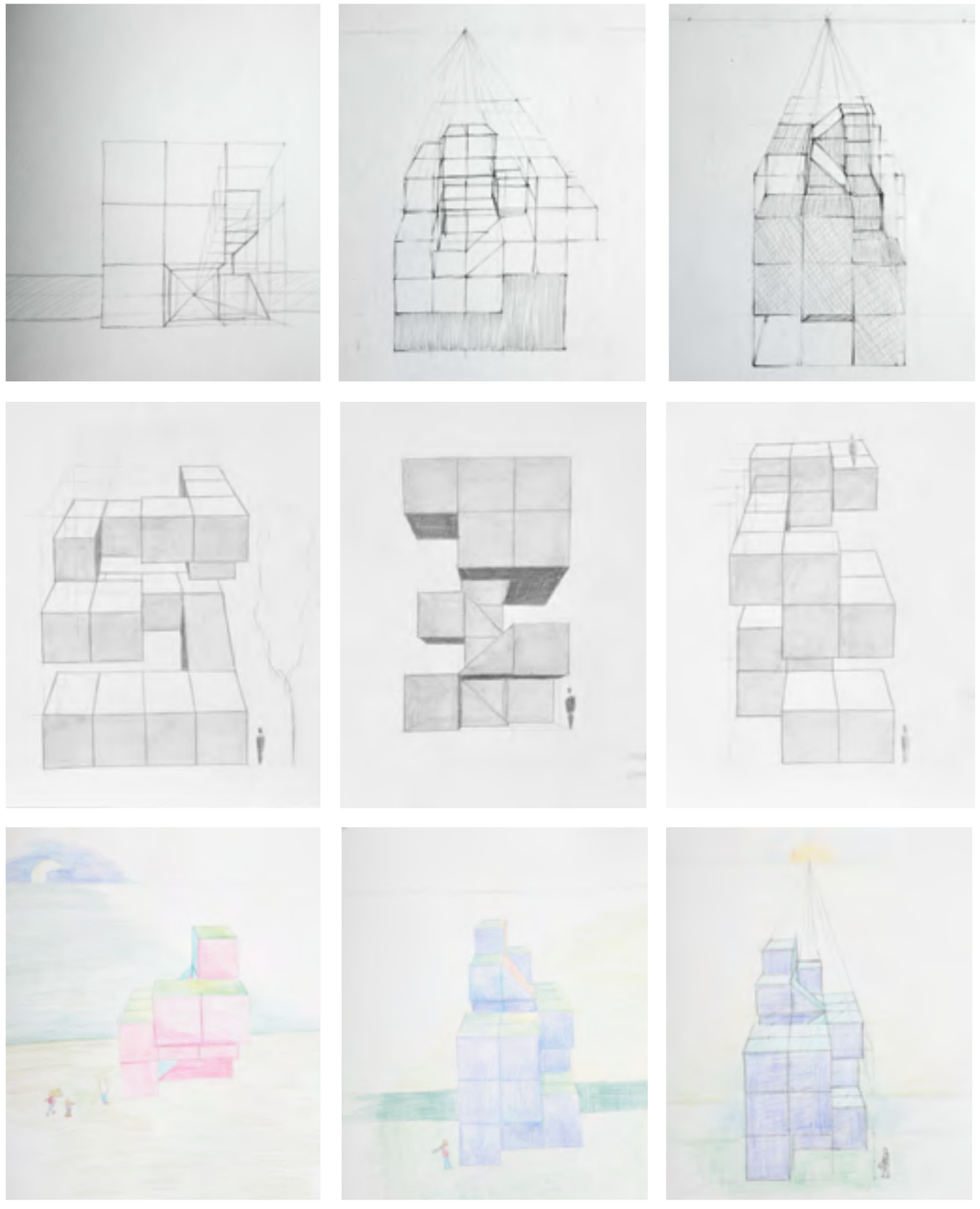


(above) Dividing a perspective square in three equal parts (principle). Because the horizontal and vertical beams perpendicular to the observer's focal direction keep their proportions you can use them as a measure. The depth of a square can be found using the DvP, the depth represents the same distance as the height, foreshortened. Divide the horizontal or vertical line in three equal parts and connect those points with the CvP. Draw the diagonal of the perspective square. The crossing points with the lines connected with the CvP provide you with the foreshortened division.

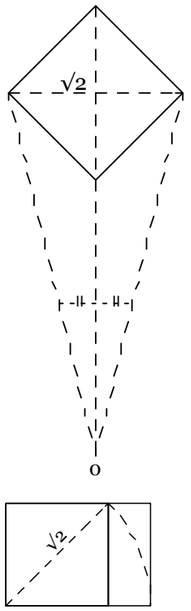


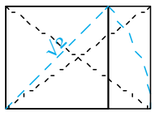
In a One-Point perspective you can draw up to four diagonal vanishing points: left, right, top and bottom.





(this page) a (rare) contextualised interpretation of the one-point perspective (Stijn Maes); (opposite page, left to right, top to bottom) basic line drawings (Ruth Dierick; Eline De Borger; Eline De Borger); shadowed one-points (Rani Couckelbergs); coloured one-points (Ruth Dierick)





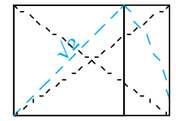
5.3 √2 One Point Perspective [27]

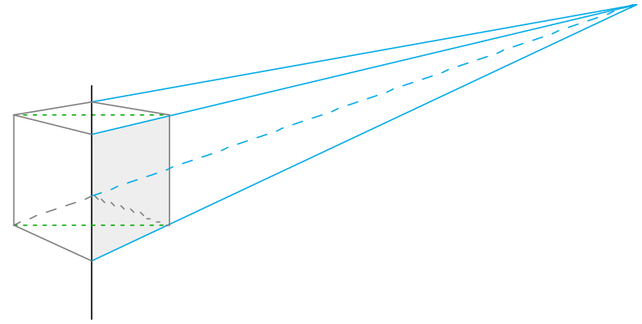
The √2 perspective is a hybrid kind of perspective. It uses one of the diagonal vanishing points to emulate a symmetrical perspective. Imagine positioning yourself in front of a cube in such a way the the front and back rib coincide. In other words you behold the cube diagonally. As you observe the cube you will see that the right and left side perspective will be symmetrical to each other.

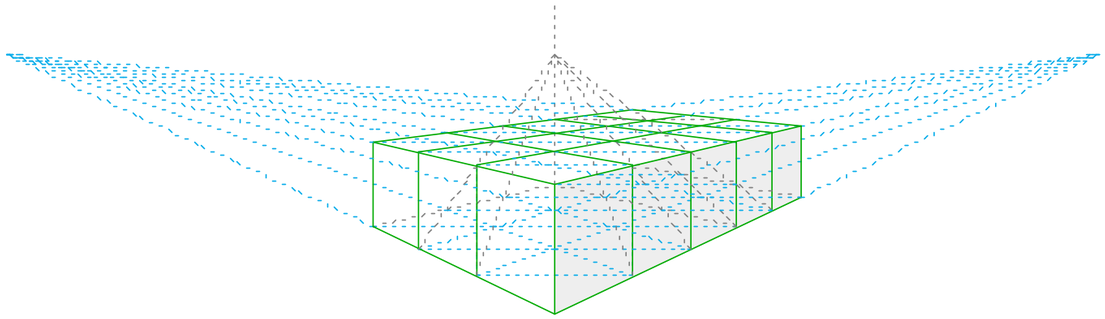
You can easily construct this kind of perspective departing from a √2 rectangle. Start by drawing a square, now draw its diagonal and use the diagonal as the radius of an arc and draw the arc downwards. The square plus the length of the projected arc form the basis to construct a √2 rectangle.

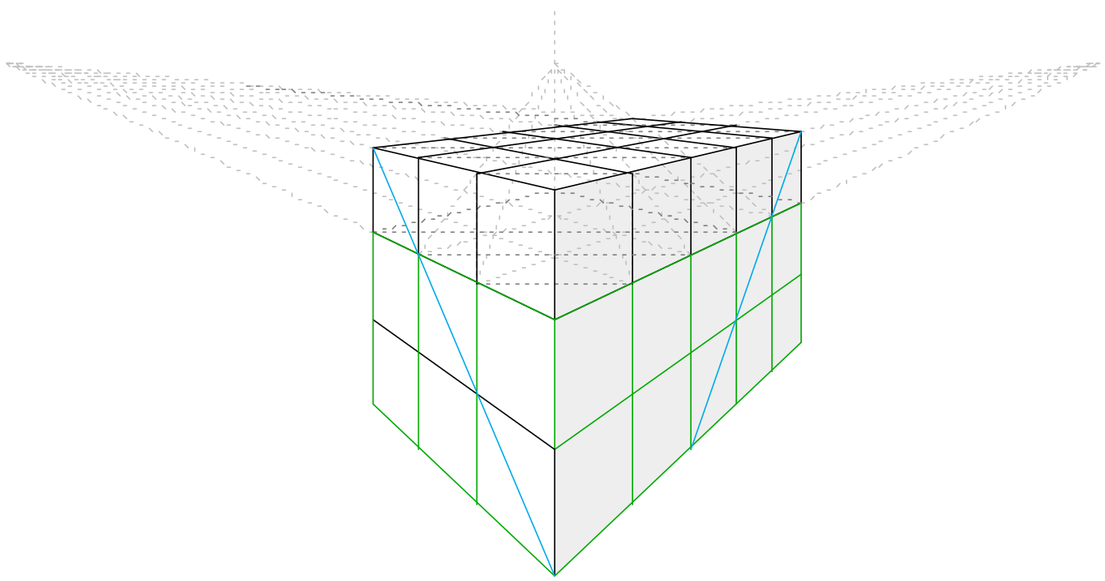
Now construct a line in the middle of that rectangle and extend that line towards a horizon above (or below) your √2 rectangle. Upon the horizon position a vanishing at about three times the width of your √2 rectangle and connect the top and bottom end of the rectangle with both the vanishing point and the front line.

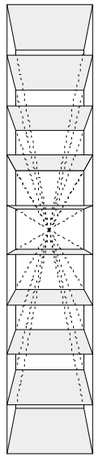
From the corners of the rectangle draw a horizontal line to the other side and connect the other corner points with the crossing points of the front line. If you repeat these steps you will obtain the spatial frame to draw your architectural structure. Diagonalising will yield the upper or lower levels. Constructing a diagonal perspective is an easy way to test the three dimensionality of your structure.

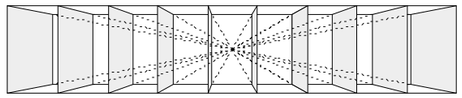






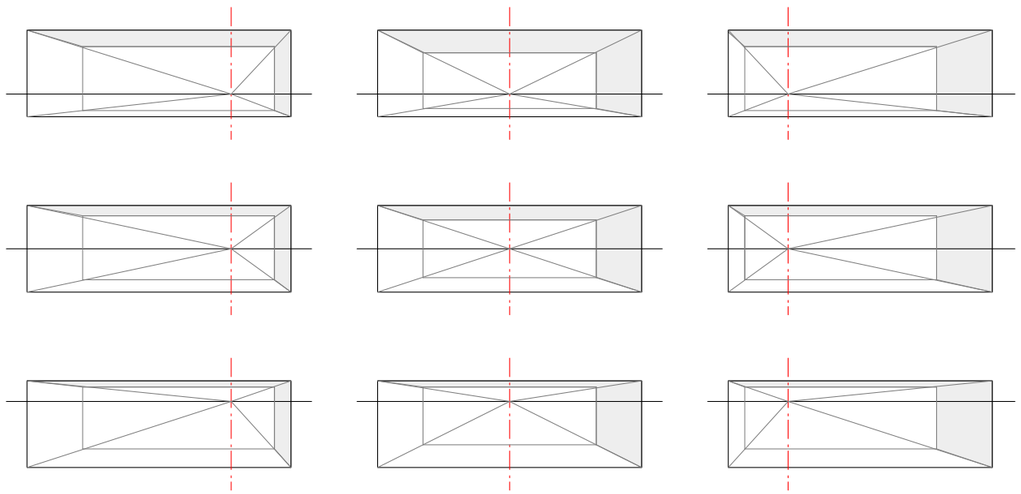


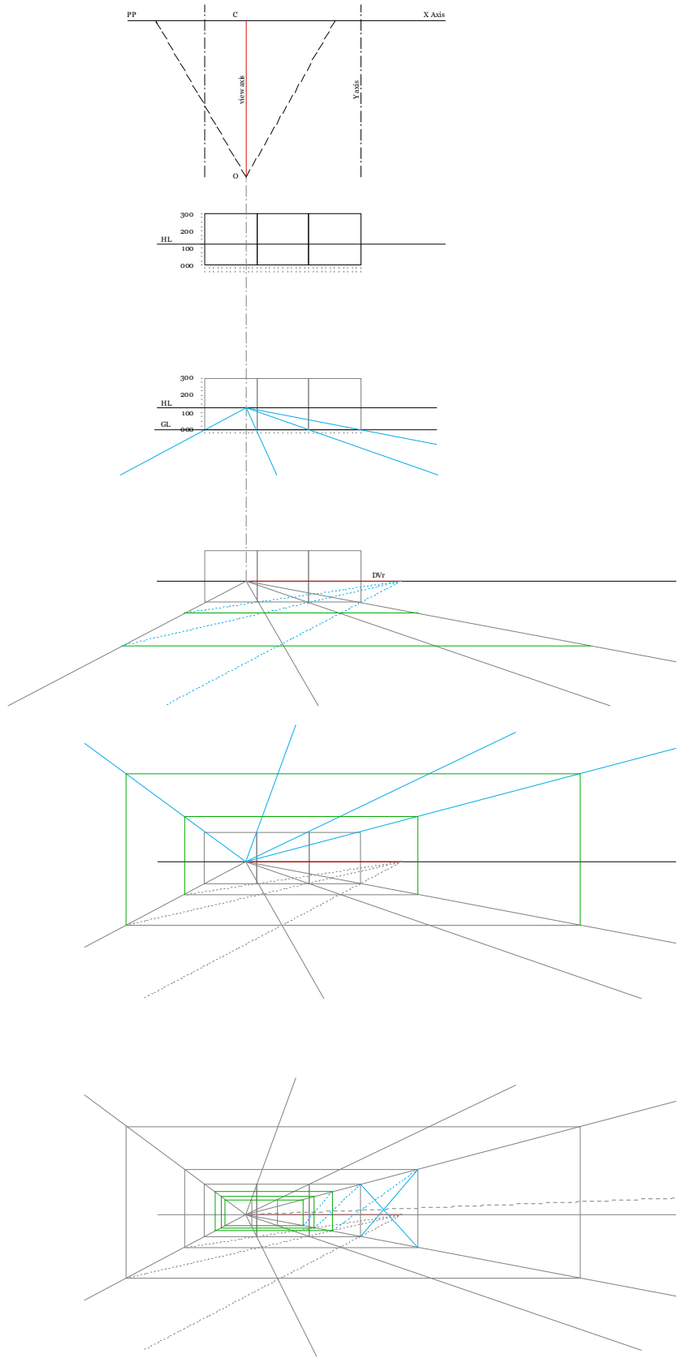




5.4 Point of View in relation to Foreshortening and Visual Effects

Receding planes in a one point perspective. The further positioned from the CvP, the more you will see of a wall, ceiling or floor. Use this principle to decide upon your position and horizon. In the following drawings try to experiment with different positions for your horizon based upon a natural point of view. The following schematic overview illustrates different positions and their spatial effect. A lower viewpoint will reveal more of the ceiling and will yield a more spatial atmospheric view, directed inwards. Your structure will appear a bit higher than intended. A symmetrical horizon will cut your image in two halves. Higher viewpoints will show more of the flooring textures but will appear lower even if you have a high ceiling.





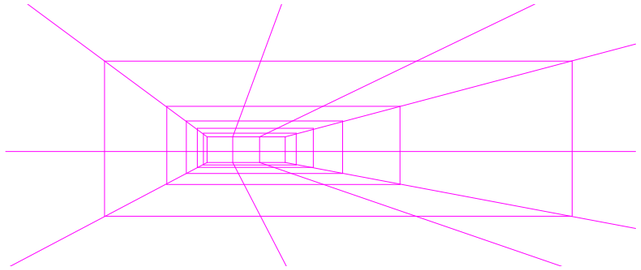
5.5. One-Point using the relative position of the observer (OC)

The line OC represents the distance between the observer and the picture plane. The observer is you, drawing and perceiving. Unless there is a specific reason to do otherwise, try to position yourself as deep as possible in the space your are depicting. That way your drawing will reveal the deepest and broadest view of the space you intend to draw as opposed to a close up of a wall or a corner.

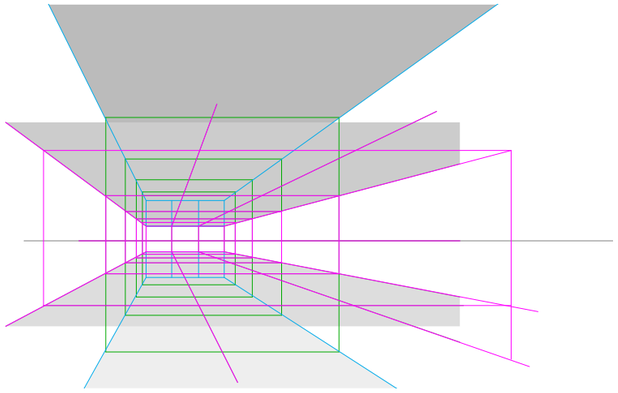
Within the illustration the observer is positioned three squares deep and looks to the back wall of the structure. This back wall is three squares wide. Draw these squares to scale as an elevation and position a horizon line upon eye level (±1,65m).

Connect the CvP with the corners of all squares of the picture plane and extend them towards the Observer. Now position your DvP to the left or to the right of your Vp at a distance which equals the distance the observer is positioned relative to the picture plane. In this case the depth of the space measured from the back wall towards the observer. Now connect the bottom (or top) corners of the picture plane's squares with that DVp. The crossing of the diagonal lines and the parallel ones will provide the points of reference to draw the foreshortened distances of the squares making up your structure. Further fine tuning can be done through taking measures from the picture plane. Transferring this information from floor to wall to ceiling will yield a proportionally correct perspective grid as a basis for your structure's interior.

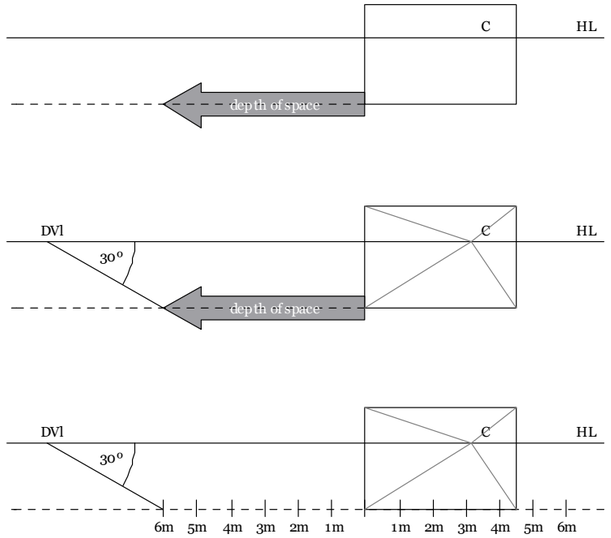
You can still tune the perspective to look deeper into the structure or to reveal about floors above or below the one you are drawing. Always check whether your DvP is positioned adequately. Positioning your DvP too close will yield 'wide angle' effects, distorting the proportions of the square planes making up your drawing. Positioning the DvP too far will yield disproportionally shallow spaces. The square where the Observer is looking from will always appear a little distorted but try to keep the proportions of your squares within their geometric limits.

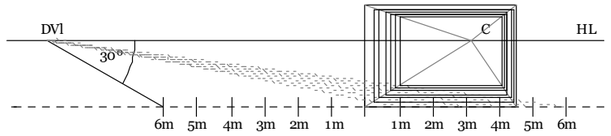


A rule of thumb says that the horizontal width of the trapezium forming your perspective square cannot be larger than its shortest vertical line. When the perspective square closest to you becomes longer than that it is your cue to stop extending the drawing in your direction. When you are short of units to define your space you can opt to extend your structure behind the picture plane using the DvP or multiplying squares with the diagonal method.



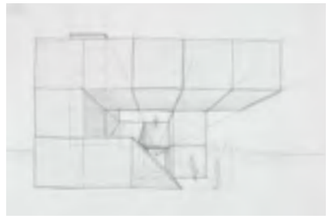
When you want to add a floor upwards to view towards a mezzanine or to reveal the view through a void in the floor you can add squares below or on top of your picture plane and extend the grid which defined your initial space.





5.6 One Point 30° method

An alternative to the previous construction method can be drawn by positioning the DvP as such that the foreshortening in the foreground of the drawing remains minimal. The back wall remains the picture plane. This method does not account for the position of the observer which generally is situated outside of the depicted space. This method is ideal for small and daunting spaces like kitchens, bedrooms, bath rooms and tight corridors.



(this page) constructing a one-point promenade architecturale (Aaron Swartjes, Heleen Verheyden); (opposite page) Tom Schoonjans

(next pages, top to bottom) Caro Baens; Amber Goossens; Laura Eulaarts; Robbe Roggemans

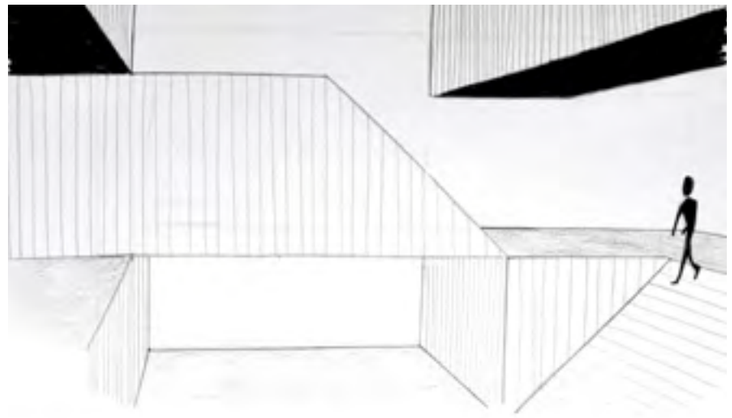
5.7. 'Promenade Architecturale'

The techniques introduced above will now be used to explore the inside of your structure starting from the front entrance going upwards. Start from the entrance. Draw a large square, which represents a fraction of the frontal elevation. Position the horizon at eye level, approximately 1,65 metres above ground level.[27] Position your CvP somewhere off centre within the square representing your entrance, your focal point. Connect all the corners of your entrance with the CvP. Now position a DvP upon the horizon line by multiplying the IR (IR = Image Range, here, the width of your entrance square) 2,5 to 3 times. Connect that DvP with the inner corner of your entrance to calculate the foreshortening of your hallway. Repeat these steps to suggest the depth of your model. try to look into your model this way to see what it is your see. A stair in front of is obtained by drawing its defining cube and connecting the front point at the bottom of the cube with the top points in the back. When the stairway is positioned opposite to the former position you can ignore it or reverse the previous construction. To construct a stairway looked upon sideways connect the bottom and top points diagonally. Check your facade for extra openings and add those to your perspective view.

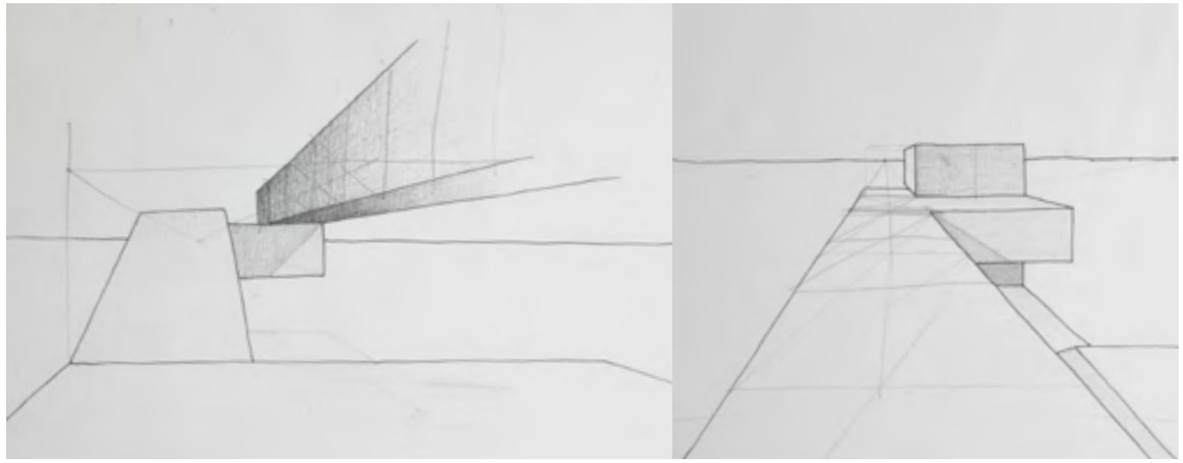
In a next drawing, imagine stepping inside your structure to draw the interior of your hallway. The key to drawing interior spaces is the suggestion of immersion, the illusion of being surrounded by walls, floors and ceilings. Consider the space where you are sitting. You are able to see the wall in front of you, part of the floor and part of the ceiling and floor. What you cannot see is the wall behind you. While drawing interior spaces you have to keep this in mind. A common mistake in drawing interiors is positioning outside the structure, as if you are suspended next to your structure. Sometimes these kind of suspended drawings are the only way to illustrate a certain detail or effect but in these series try to avoid those kinds of drawings.

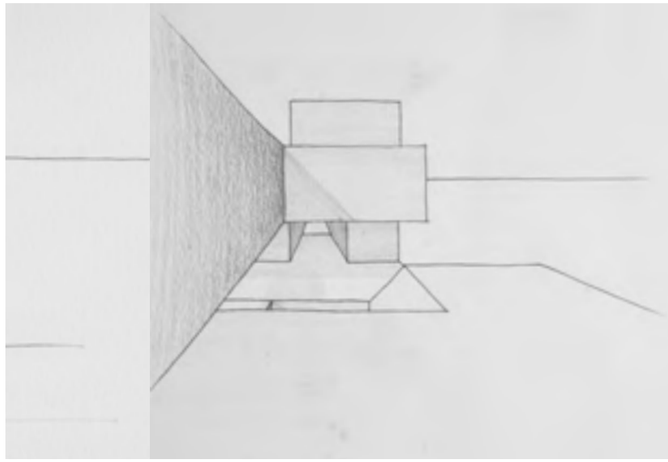
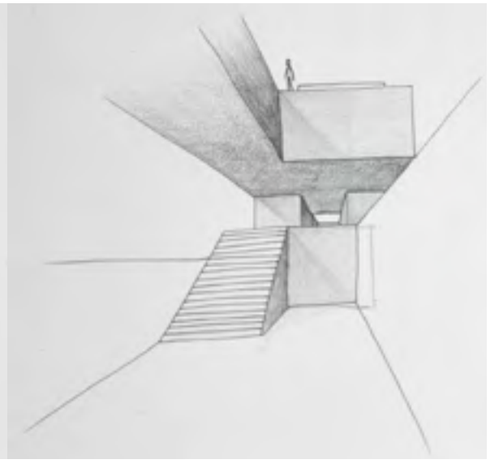
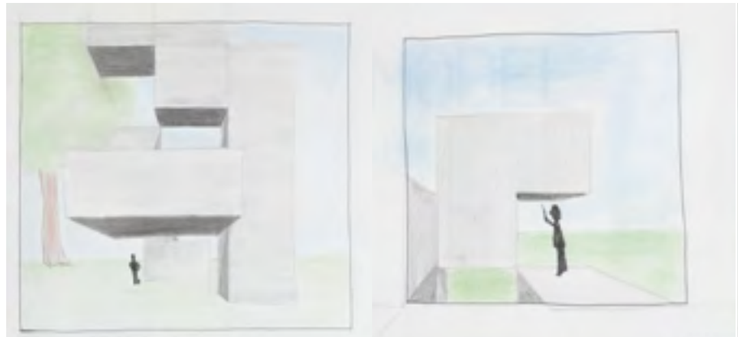
Divide an A3 sheet in four quadrants. In each quadrant draw a large square, a little less than half of the quadrant you defined as your frame. Position a horizon line around eye level and a Vp somewhere off centre from the square. Discern the side you want to focus upon and keep that side as the largest distance from the side of the square. Now connect the for corners of the squares with the Vp and extend them until you reach the frame of your drawing. Study your model and proceed to climb upwards in a series of frames to visualise the spatial sequencing. As a rule of thumb make a drawing every time you go around a corner or reach the top of stairway. Don't worry about stairs, interpret them as a 45° slopes, reaching from bottom to floor. Cut your drawings and fix them on a sequence of A3 sheets.

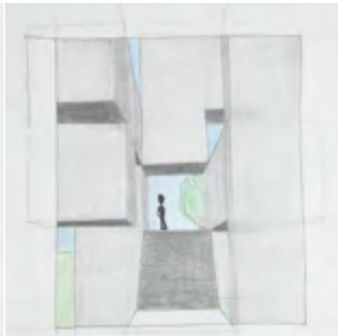
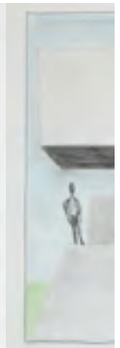
Design your story upon an A3 sheet in the same direction as your plan set. So your walk through becomes an extra layer of information able to communicate the circulation route through your structure. While organising the drawings try to pay attention to the sequencing of your *promenade,* but you can also experiment with asymmetric storylines by enlarging or scaling down certain frames to focus upon less or more important parts of the structure's circulation route.

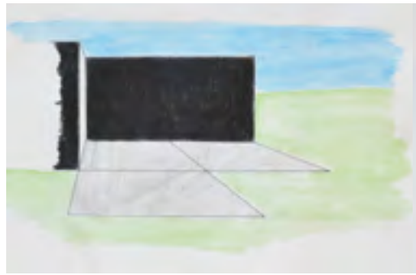
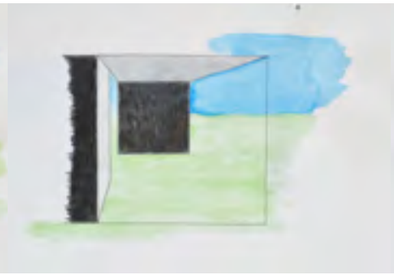


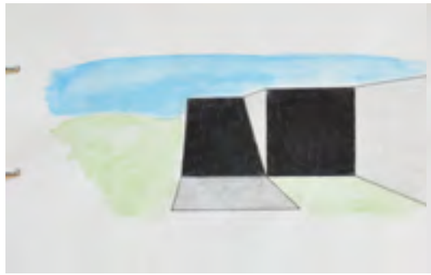
Tom Schoonjans

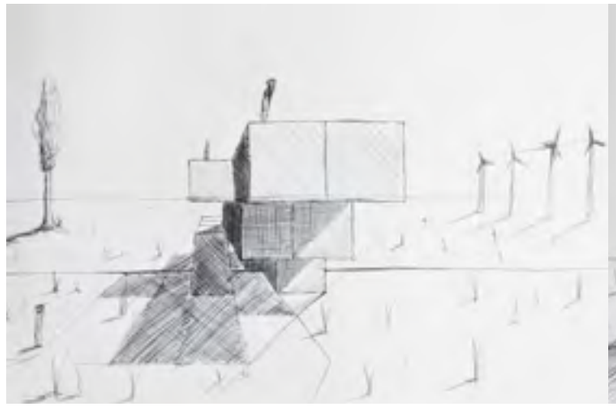
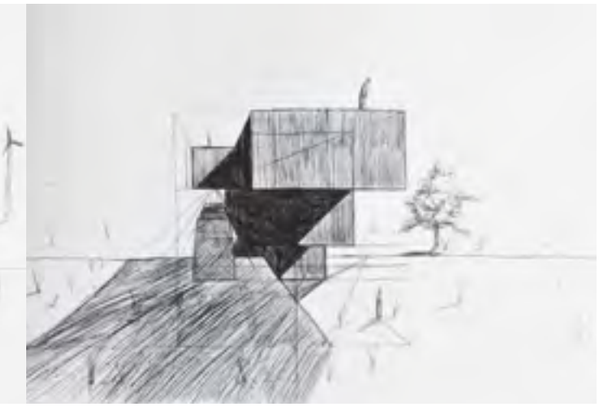
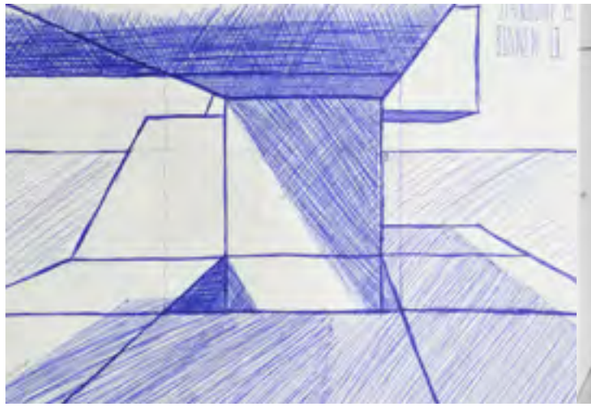
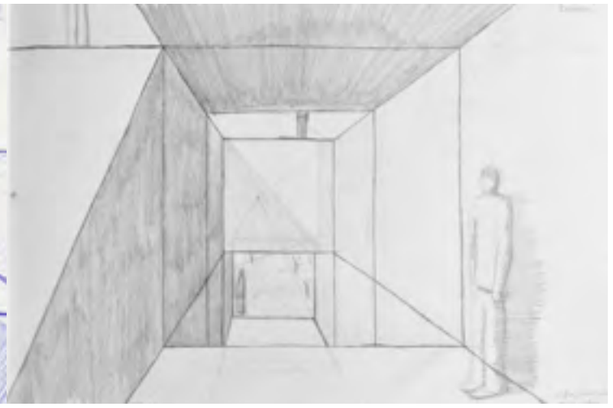


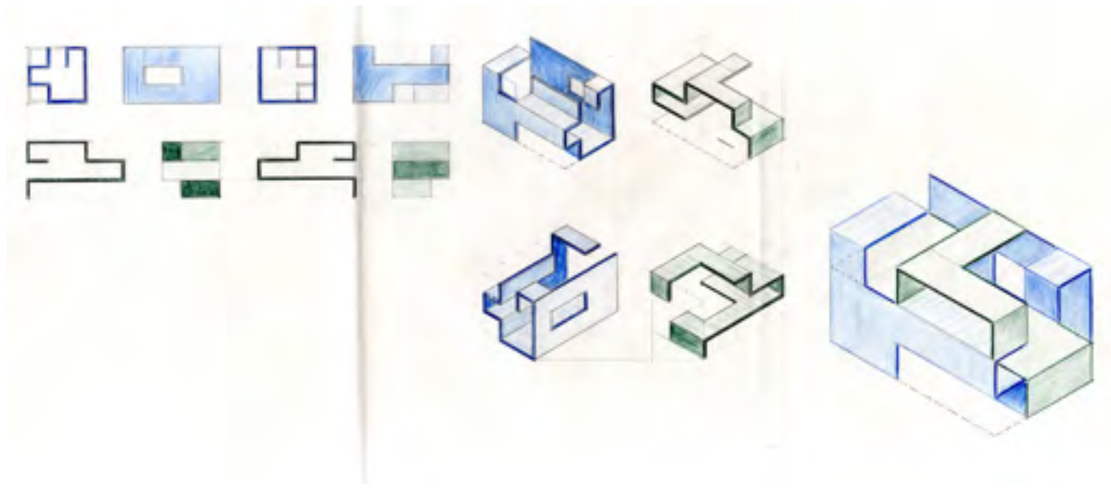





6 folding the model



Folding principle: (top to bottom) the blue shapes represent the folds in the X direction; the green shapes represent the folds in the Y-direction; the next drawing shows what the folds look like when reassembled individually and the last one superimposed the previous two shapes into one final 'folded' model (image: Tom Schoonjans)

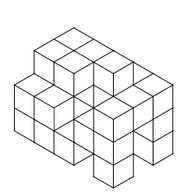
The following steps will open-up your structure, transform it from cubes to walls and floors. The process could be compared to wrapping or folding strings of paper around your structure's section. You can process this phase in several ways: physically through modelling, digitally and through physical drawing. Combining them offers several vantage points to inform the spatial development of your model or structure. Both processes are based upon the same constraints by using similar process which starts from sections.

6.1. Folding the Model Physical Drawing

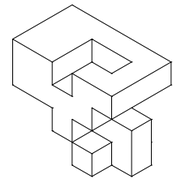
In order to explore the folds draw two isometrical[29] exploded sections, latitudinal (the structure's width) and longitudinal (the structure's length). Count the amount of rows in the latitudinal direction of your model (there are 6 or 7), now count the amount of storeys. Draw lightly, using an H or even harder pencil. First of all draw a frame within an A3 sheet of paper ±2cm from the boundary of your paper. From that frame at the left bottom upwards position an isometric rectangle which length equals the amount of squares on the long side of your structure multiplied by the amount of storeys plus one. Inthe illustration's case this conforms to 7x4 plus one, yielding 35 units. Again draw on a 1/3 scale where the scale of the cubes' ribs are 1cm.

At the bottom of the rectangle draw three horizontal isometric squares in a row, and extrude the squares to the maximum height of your structure. Divide the extrusion into isometric cubes, to the full height of your section. For the moment represent the sections as a set of cubes which are stacked to the maximum height of each section as this height will determine the position of the next row of cubes. Upon the surface plane move one row upwards to avoid that the next row of cubes will intersect – or touch with the former one. Now draw the same constellation of cubes and repeat this step until you have delineated all the rows of cubes present in your model. This constellation shall be called the X-fold. The stacked cubes are positioned at equal distances of each other.[30]

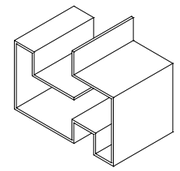
Now measure the total length of your model, and draw this length, 30º downwards right, at the top right of your paper. Now construct an isometric rectangle corresponding to the surface of one row of cubes (1cm). From the isometric rectangle construct the height of your structure. Isometrically move one 1cm downwards and, (isometrically) perpendicular to the former shape, redraw the same shape. Repeat this step twice to obtain three rows which do not intersect and are positioned at equal lengths of each other. Inscribe the cubes into the shapes. This constellation will be called the Y-fold.



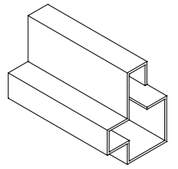
solid model



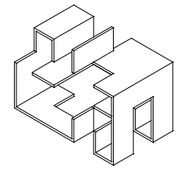
negative cast of the circulation route of the solid model



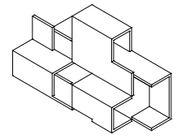
folded X-fold



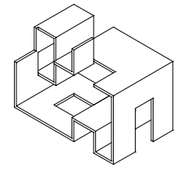
folded Y-fold



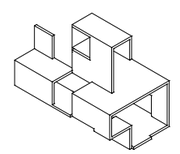
folded X-fold minus circulation route



folded Y-fold minus circulation route



improved X-fold following folding constraints



improved Y-fold following folding constraints

superimposed X&Y fold: final model

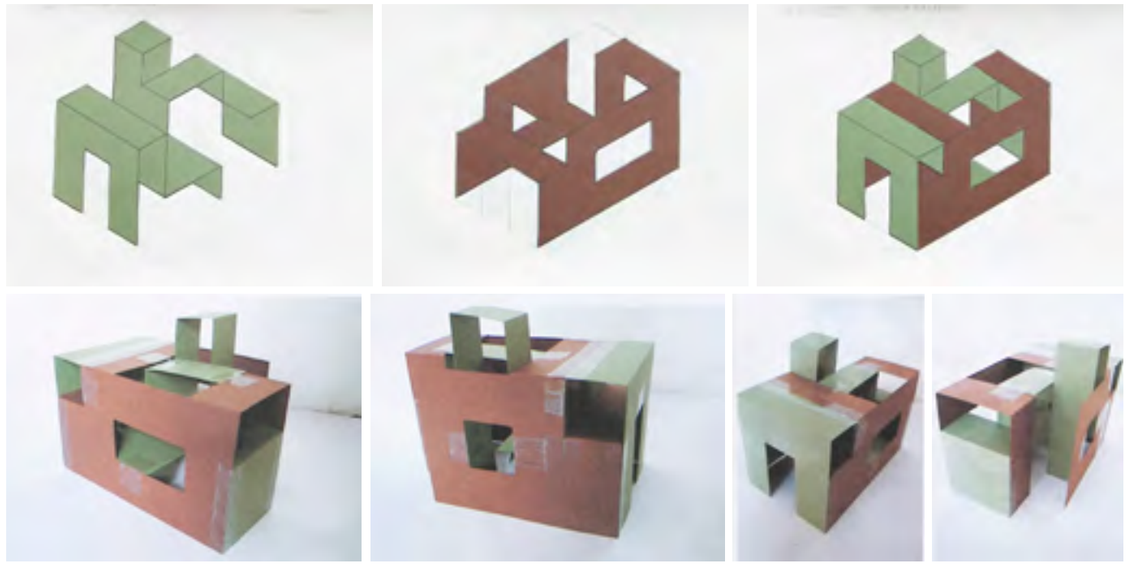
Folding Constraints
Whether you draw the fold digitally or physically each section is folded individually untill all sections (latidunival/ longitudinal) from front to back are drawn as a fold of one unit. A fold wraps itself around every section and starts at a bottom end of a section and ends at another end or within the structure. The fold does not run via the surface line the section. If a section does not touch the surface line this constrain does not hold.

A fold is one continuous line (representing a wall or a floor) and does not touch or cross oneself. The fold runs in one direction only, X or Y. When a section consists of two separate elements, because of a void or stairway, combine them to achieve a continuous line. You can only use one line to combine them.

The string you fold is 30cm to scale, and extends symmetrically 15 centimetres from the reference lines.

The stairway and the circulation route remain the same position in the solid model and the bounding box of initial solid model also remains the same. Both models share the same formal DNA. You can maximally trace underneath one cube in one fold.

Draw as much folding variants within each section you can imagine, along the preceding constraints. One trick is to try all possible points to start from and see where the fold ends or runs dead. Assess you folds as a you would assess a section. Mezzanines provide great outlooks upon the space beyond a floor. Create spatially interesting sections rather than trying to wrap zig-zag folds. Trying to trace the perimeter of your section is always a good starting point.



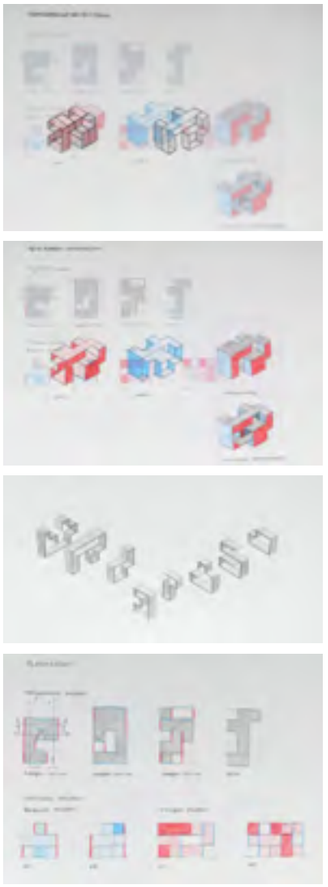
X-fold; Y-fold; superimposed fold and a model study using the same colours (Amber Goossens)

With a heavier pencil impression trace the section in the front plane of the constellation of cubes, as present within your model and sections. Repeat this step for each row of cubes. Make sure both X- and Y-folds are drawn in the same direction. The bottom section of the X-fold represents the front of your model, the front row of your Y-fold represents the left side of your structure.[29] Using a sheet of tracing paper explore possible folds along the previously mentioned constraints. Start on either (bottom) end of your section and follow the section in a continuous line with the aim of tracing as much floor and wall area as possible while keeping in mind that your line has to cross the entire perimeter or profile of your section. Doing so will keep the original formal appearance of the section but now defined by walls and floors. Your trace starts on either end and finishes at the other. The fold is – either closed, running from side to side or – kept open. When you encounter a stairway you have two options. When the stairway's slope is visible in the section you are obliged to draw the stairs. Make sure the stairway has two landings (bottom and top). When the stair's slope goes in the opposite direction (rising towards you or away from you) you can ignore the stairs as these stairs will emerge in the other section.

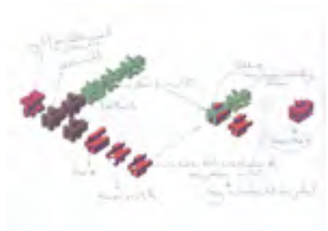
Try different possibilities to verify which trace works best, creates the most floor to wall surface, opens up spatial combinations and views. Start with either X-fold or Y-fold and proceed until you have traced all your exploded sections. Draw the possible traces in series, revealing the different possibilities horizontally or vertically for each section. Select a qualitative trace for each section and recombine them on a new sheet of tracing paper. On top of your original drawing draw the different folds as walls and floors of 30 centimetres extending symmetrically from the reference lines.

Take a new sheet of tracing paper and recombine the two exploded views so that they are fused into two separate entities. Now superimpose or fuse the two folds into one structure again. Imagine intertwining the X-fold and the Y-fold into one structure. Observe that the X fold has walls in the Y direction and, conversely, the Y fold has walls in the X direction. The easiest way to reconfigure your structure from these X and Y folds is by drawing a new plan set based upon the wall and floor information of the two separate folds. Since the folded model has the same dimensions as your solid model you can use your initial plan set (physical or printed digital) as a backdrop to draw the folded version. Start with the ground floor and move , gradually, upwards. Look at the isometry of X-fold and copy all the walls you encounter upon each floor onto your plans. Do the same for the Y-fold. From your initial plan set copy the position of your stairs and hallways at the same position you used in the former model. Draw your walls as 30cm thick solids symmetrically from the reference lines. Your folded structure now consists of walls and floors which delineate rooms and voids.

Now study your plan set. Are you still able to enter the structure at the same place? Follow the same route? If not, can you fix that? Secondly, is every room accessible? If not, take away a wall unit (a square) allowing you to enter that room. Finally does every room have a window? If not take away another wall unit (a square) providing daylight for that room. When all the constraints are met construct an isometric perspective of the folded structure which is based upon the new plan set.



folding process (Laura Reyniers)



(top) first attempt to translate the folding process into a digital process (drawing by colleague Bart Mermans) and (bottom) modelling the folded model based on substraction.

(opposite page) a matter of choice: for each section, by following the folding constraints, there are a limited number of possibilities, try to draw them all and choose amongst the possibilities which one of them provides the most appealing, line, fold, or spatial effect. Extrude them in a parallel projection to see how they work in three dimensions.

(top section) exploring several possibilities to extrude the transverse section. The crossed version exemplify impossible folds caused by stairs not being fully accessible. (bottom section) Drawing the final choices as an exploded cavaliere projection. (drawings by the author)

6.2. Folding the Model, Digital Drawing

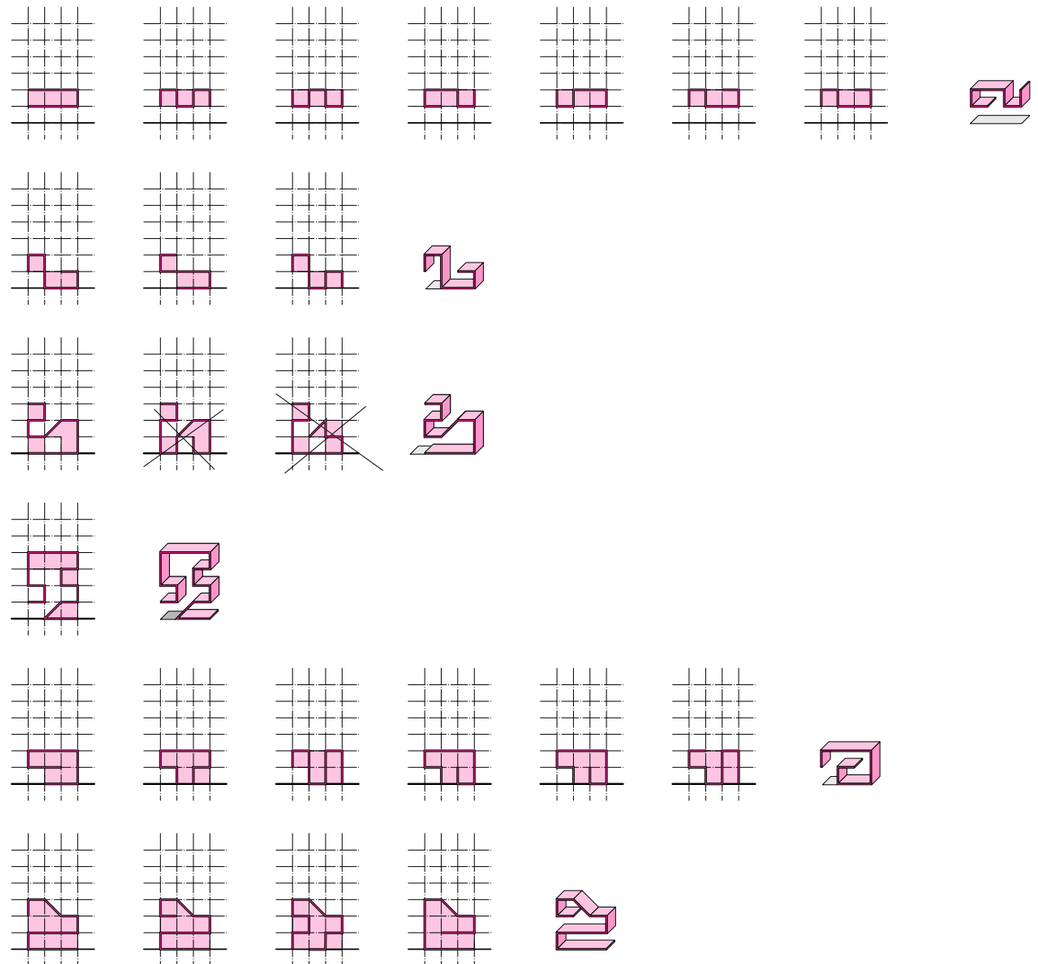
Following a similar process as the one described in 4.1 we will construct a digital folded structure. Turn to your solid model plan set and save the file under a new name (i.e. *something_folded*). Copy and align the latitudinal sections on a place distant from your original plan set. Do the same for the longitudinal sections, next or underneath the latitudinal sections. Create a new layer and trace the individual sections with a double polygon using an offset distance of 30 centimetres which grips in the middle. Make sure your polygon is set to drawing polygons as opposed to plotting lines. Trace the section with the aim to create as much wall and floor surface as possible, use a distinct colour for the trace. Stairs following the folding direction are followed, stairs sloping in front of you are ignored. Copy the first latitudinal section next to the first one and try a new trace. Try as many variations as you can. Then move to the second section and repeat the previous steps creating as much variations as you can. When you have explored the variations for the latitudinal sections move to the longitudinal sections and trace them using the same constraints.

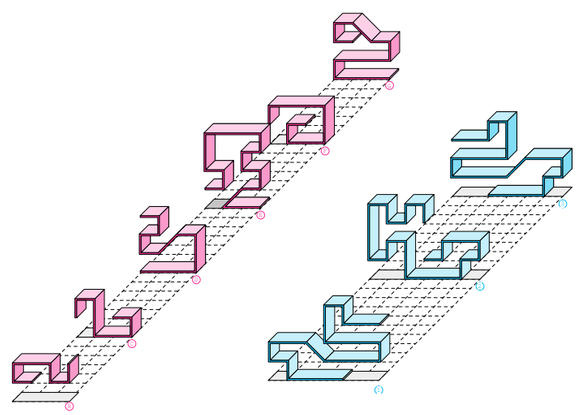
Make a new layer and copy-paste the X-folds. Switch to front view and extrude the X-folds 3 metres. Switch to oblique or isometric perspective to assess the folds in three dimensions. Imagine combining the subsequent folds into one whole, try different combinations. Make another layer and copy-paste the Y-folds. Switch to side view and extrude the folds by 3m. Again switch to oblique or isometric view to assess the folds three dimensionally.

Select the spatially most satisfying folds, mark them according the section marks (AA, BB, ..., 1.1, 2.2,...), and copy them somewhere in your drawing. Return to the plan layer. Offset the centre lines by 15cm in each direction. Change the colour to a 50% grey-ish colour and change the dot - dash - dot line to a dashed line and decrease the line thicknesses of the offset. Keep the section lines intact. Copy the circulation route your structure underneath these sections. Map the walls and floors by studying the selected folds. The latitudinal sections will yield vertical walls, the longitudinal sections will yield horizontal walls. Floor areas can be mapped by using the rectangle tool with a coloured fill. Don't worry about possible small gaps (yet). Colour your horizontal and vertical walls in a distinctive colour as to be able to discern between them when rendering. Check whether every room is accessible and add or delete walls or floors if necessary to do so.

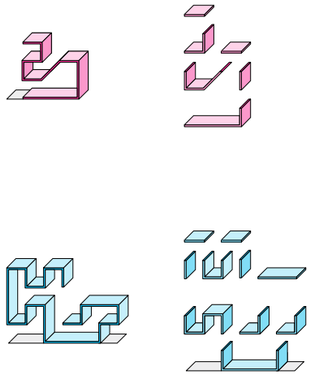
Check whether the original passage way stayed intact. Check whether each room has at least one window (you create a window by eliminating one wall unit, 3 metres wide). Finally delete all floors you do not need to circulate through the structure, doing so will open up your structure vertically, creating interesting interior vistas. Retrace the floor areas by using the single polygon tool. The floors extend to the inner edge of the structure indicated by the grey dashed inner lines. Replace the original solid plans by a copy of the folded ones.

Return to the traced layer and map the walls and floors onto the plans. Extrude the floors by 30 centimetres and extrude the walls by 270cm. Check the corners of the walls for intersections and choose which one of the meeting walls you want to diminish. Walls should touch and not overlap.

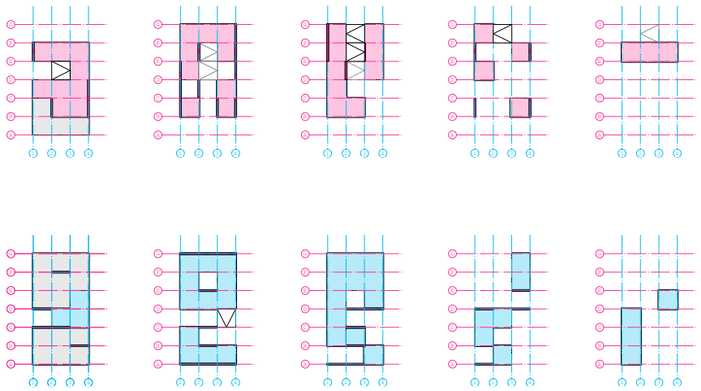




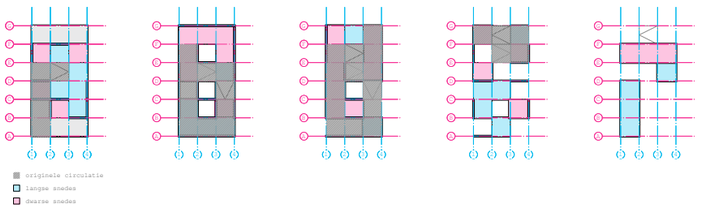
Exploded view of the translation process required to turn the parallel projection into plan-views. (drawings by the author)

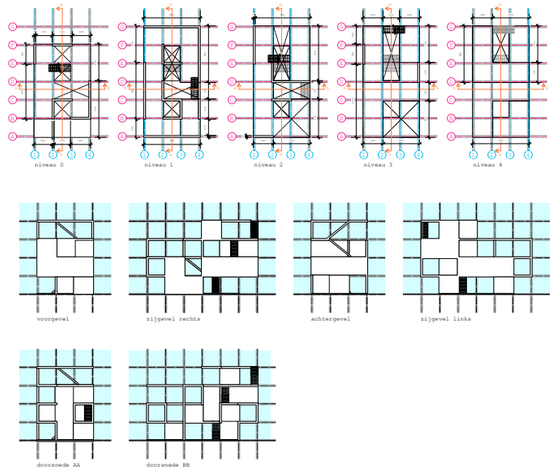


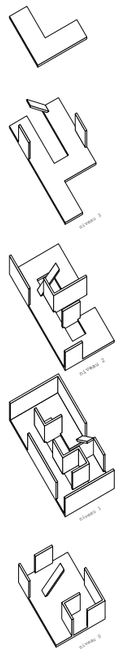
From the translation process the structure is mapped onto two plan-sets: one representing the X-fold, the other one representing the Y-fold. The floors and walls are derived from the parallel perspective. Note that the Y-fold (red) only has vertical walls and that the X-fold (blue) only has hoizontal lines. The grey areas are the areas where there are no floors.

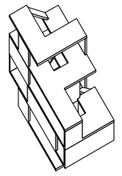


After mapping the X- and Y-fold you will have to put them together to arrive at the final 'folded' model. To do that copy one fold on top of the of the other and erase all doubles. This will provide you with the final folded plan-set of your structure.



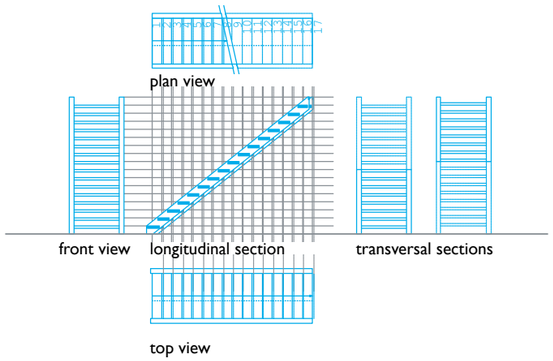






When the final folded model is mapped proceed by turning the schematic plans into measured plans by using the proper conventions for stairs (see following pages), voids, section lines, ... From the plans you can now project a set of facades, sections and an exploded axonometric view as well as a unified axonometric view.

Schematic drawing of the projections of a stairway.



6.3. Calculating Stairs

Up until now you have been working with monumental stairs of 3m wide which were drawn as slopes. The following explains how to model stairs. The stairs will be the straight flight type of staircase of 1,2m wide. Stairs consist of a tread (T), the area your foot stands upon and a riser (R), the vertical area. To calculate a stair you can use the following equation:

$2xR + T \approx 57$ to 63 or $57 < 2xR + T < 63$
$R = \pm$ 17cm to 18cm and $T >$22cm
then you divide the floor to floor distance through R
depending upon your intention you can round this figure up- or downwards which will provide the amount of stairs needed
now you divide the floor to floor distance through the amount of stairs which yields the true distance of R

Calculation is based upon finding average numbers, for instance:

2x17+22 = 56 (too small)
2x18+22= 58 (between 57 and 63)
=> 300/18=16.666=>17 (number of stairs)
300/17=17.65cm (height of the stairs)

Needless to say you can play around with this equation based upon your intentions. You can aim at a steep stairway or a lazier one. Bear in mind that lazy stairs could need a larger stairwell, to avoid bumping your head or for aesthetic reasons. Model the design of your stairway by drawing the floor to floor height (the rise) adding the slope or pitch line. Start at the bottom of the pitch line (the slope of your stairway from floor to floor) and draw a vertical line of 17.65 cm. From the top of that line draw a horizontal line until the pitch line. Repeat this step until you reach the top of the stairs. Draw every thread as a rectangle, about 10 centimetres high, underneath the horizontal thread line.[31] Now add a string, the beam holding your stairs. The string is minimally the height of your thread and riser. This will enable you to model the stairs as blocks, providing a view upon the spaces you are about to explore.

Make sure the bottom of the stairs starts at the start of the pitch and that the top of the stairs *arrives* at the top, spanning 3m.Extrude the stair blocks 100 centimetres and the string 10cm and return to plan view. Copy the string to the other end of the stairs. Create a symbol from your 3D stairs and position the symbols on their original positions.

Turn to front view and make sure the stairs and the walls align upon the ground level of each floor. Make a group of each floor and stack them on top of each other. leaving the height of a floor plus one unit between them. Create a new layer and copy the exploded constellation. Stack the floors on top of each other. Study the stacked version and check where facade elements or interior walls touch each other. Combine these elements into one whole.

Concerning corner solutions. Two walls in different directions which touch each other make a corner. You can choose to distinguish between the front and the back facade by not combining them or decide to model the facade as one whole. Whatever you choose the panels of each facade should be modelled as one material, that is, obscuring their square origins.

The new structure will from now on figure as material to introduce and study interior perspectives, two- and three point perspectives. From the set of new plans you will produce a new planimetric representation of the structure. The new plan-set consists of all plans, all facades and a selection of two or more defining sections.

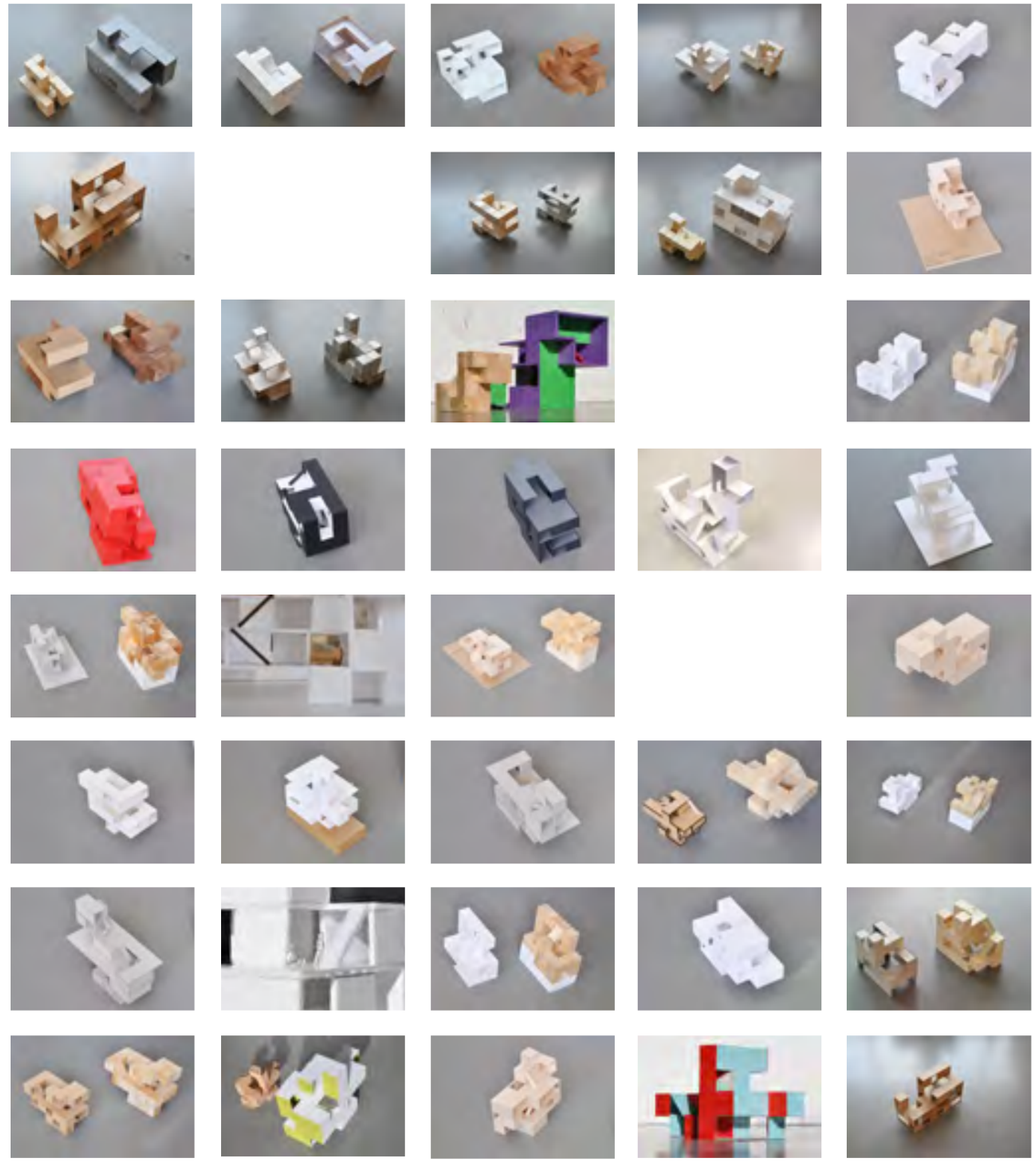
Parellel projection of the same stairway

(opposite page) random selection of models

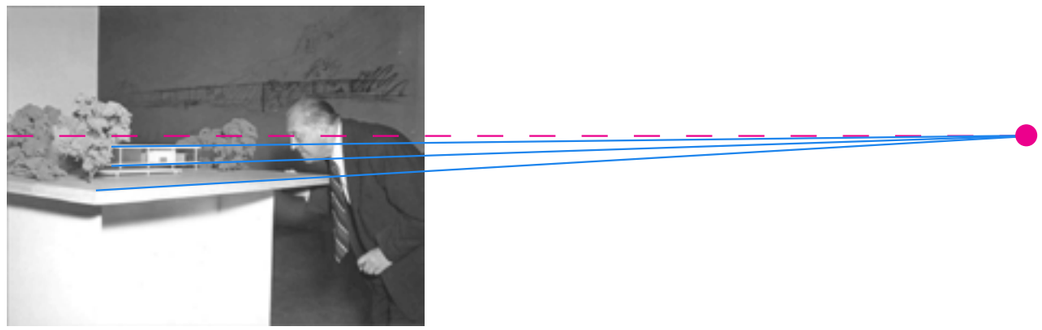
6.4 Building a New Model

Using 3mm thick cardboard or other material construct a (preliminary) physical model of your folded structure on a 1:100 scale. The model will be used as a reference for drawing and further modelling. Do not hesitate to change windows, spaces or details, improving your structure by modelling but keep the basic constraints in the back of your head. Start by constructing the ground floor and its walls, check whether some walls coincide with other floors. If they do make them as large as they appear in the section, spanning several floors. Study how walls meet, how corners are made, perhaps even add colour to your model. Be aware that darker colours will blur the shadow information.

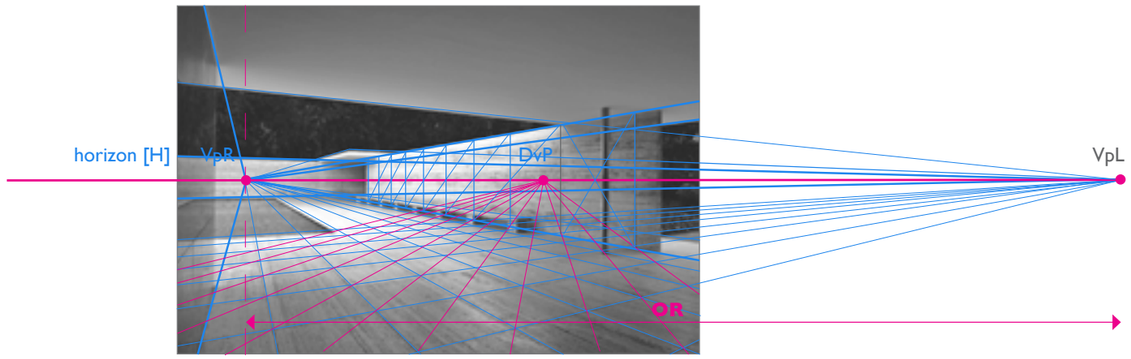
You can emulate the stairway by using a sloped sheet of cardboard, in my experience using a tightly ribbed sheet of cardboard works even better. If you really fancy to do so you can construct the stairs in any form you like too, but that is your decision. When you have built the interior photograph the elevations and the interesting views in a studio situation using a strong light. Then construct and add the facade and roofs to the model and photograph the elevations and interesting viewpoints. Add the photos to your collection of the folded model and keep them for further reference.



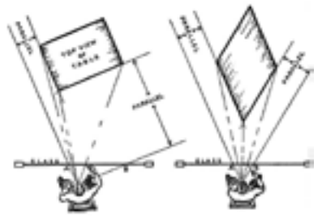
7 **perspective drawing II**



The folding process has opened up the model, now it is time to explore the new spaces of the folded model. In order to do so the previous walkthrough, which was based on the circulation route through the solid model, wil be expanded with information about the actual spaces lying behind that passage way. The goal will be to extend the initial series of drawings representing the walk through by adding new drawings. Where one point perspectives look straight ahead towards the picture plane these new drawings will start moving around. If you observe the floor, walls and ceiling making up a room while you move around you will see that the perpendicular planes will converge to two different Vp's. Where a one point perspective drawing can be drawn from a section or a an indication of a back wall two point perspectives are more complex to construct.



Ludwig Mies van der Rohe, Barcelona Pavilion (Barcelona 1929, reconstruction 1986) The scheme illustrates the perspective grid of a two point perspective and its key features: Horizon [H], Vanishing Point Right (VpR), Vanishing Point Left (VpL), Diagonal Vantage point (DvP) and relative distance of the observer relevant to the depth of space (OR). More often than not one one of the Vp's will be positioned outside of your drawing area.



Suppose you trace on the window what you see outdoors. The glass represents your picture plane, similar as your drawing paper is used as picture plane. Suppose there is a table out on the porch. The vanishing points are A and B. These two points are found where the lines pass through the glass when they are extended from your eye parallel to the two sides of the table. Note that the points are positioned quite far from each other. If you space the points to closely (as in the right hand image) the table would have to be diamond shaped to be parallel with the lines from the eye to A and B. Distortions such as these lead to misinterpretations and exaggerations in design as well as in communication. In free hand sketching it is not necessary to locate these points exactly as long as you remember to keep them well apart. As a rule of thumb we will use a distance of 5 to 6 times your image range. (source Ernest R. Norling (1939), Perspective Made Easy, Dover Publications inc.)

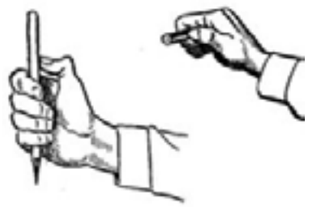
7.1 Two point variations

7.1.1 Analytical Observation

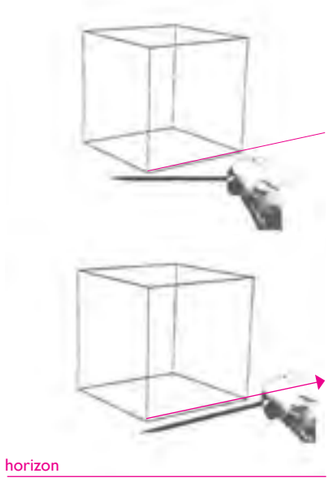
The best way to internalise and embody the proportions of a cube is by analysing a real cube in different positions. Build yourself a cube consisting of three planes of 40cm (or even more). Make sure to make the cube transparent as doing so will provide a view upon the *farthest rib* of the cube, the rib which is furthest away from you. The larger scale will be easier to measure. The following passage illustrates how to draw a cube *from observation*. Observation is a bit of a misleading term because what this technique does is translating a projection into a drawing, using the drawing paper as a projection surface. By looking, measuring and projecting directions you will translate three-dimensional information onto a two-dimensional plane, your paper.

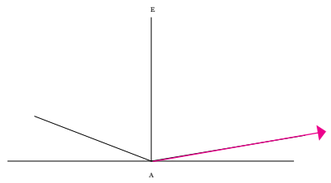
Take a sheet of A3 drawing paper mounted on some sort of support and position yourself in front of the cube. Put your cube some 2 to 3m from you and as such that you can see the top surface of the cube. Sitting too close will yield wide angle measurements, positioning the cube too far will hinder easy measurements as the cube will appear flatter. Make sure the closest and the furthest rib do not coincide (otherwise you will create a√2 perspective) and that the sides are not perpendicular to you, otherwise you will end up drawing a one point perspective, which is not the aim of this session.

In order to use the support as a projection plane you have to measure all the lengths and proportions with your arm stretched, your pencil parallel to the vertical picture plane. Varying the position of your arm will yield different measurements and a distorted cube due to distortions of foreshortening. Slopes and pitches can be measured with a loose arm since they remain the same, but make sure the pencil remains parallel to the picture plane.



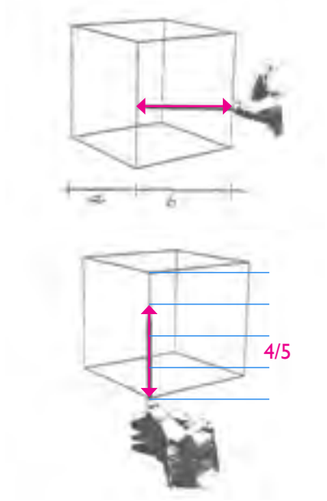
Using your pencil and thumb to take measurements. (reference)



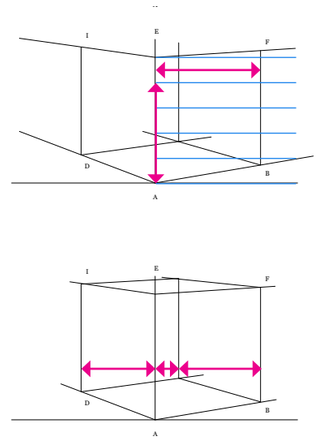


Start by drawing a vertical line, about 10cm high. Draw lightly. This line represents your closest rib, the largest rib in your drawing. Its drawn scale will determine the scale of your cube and the rest of your drawing. At the bottom draw a horizontal line as a reference for your drawing, lightly. You can use this line to assess slopes from observation. Now hold your pencil in front of you, and align it with one of the bottom ribs of the cube, remember to keep the pencil parallel to the picture plane. Fix this position and move your drawing support behind your hand and superimpose the line representing at the bottom of the the closest rib in your drawing. Copy the direction you are holding onto your support and repeat the same procedure for the other (horizontal-diminishing-sloping) ribs. Initially there are four directions to copy. If all went well, one of the sides will slope more than the others, this will become the short side of your cube.

Now stretch your arm completely and hold your pencil horizontally. Measure the (scaled) distance



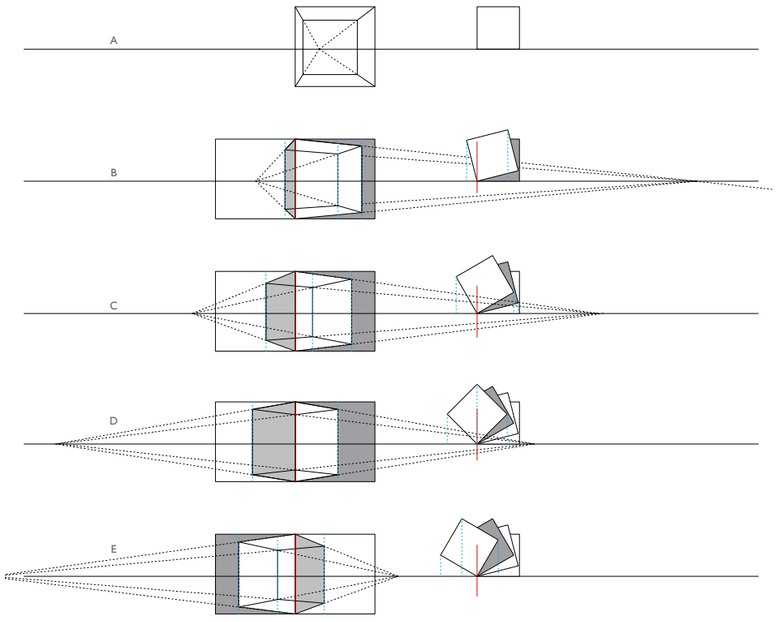
of each vertical side by gauging the distance between the tip of your pencil and your (moving) thumb. The tip aligns with the side of the cube and your thumb moves upon your pencil until you reach the closest rib. Maintain this measurement on your pencil and turn your pencil 90º in order to compare this measurement with the length of your closest rib. The measurement should be less than the (scaled) length of your closest rib.



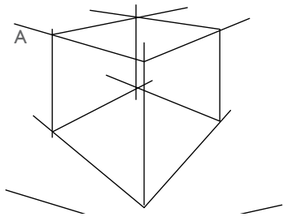
Try to discern the fracture. How many times does the measure fit into the closest rib – 1,5 times, 3 times, 4 times, 5, 6, 7, ... Mapping the measure on your closest rib and transferring the measure horizontally from the closest rib to the direction you are drawing will provide you the proportional depth of the panel you are drawing. Keep in mind you are making a sketch. Measurements higher than 9 call for a bit of a round up, no one will notice the difference between a drawn 1/9 or 1/10. Measuring and estimating these fractions takes a little practise. Repeat this procedure for the other side. If all went well you will now have drawn two sides of a cube. From this information you should be able to finalise the drawing without looking at the cube since you can now connect the missing points to the horizon line using your vanishing points.

Generally the long side of a cube has its Vp's located somewhere outside of your paper space. The other side will be located within or close to your paper space. When you have drawn the converging lines make sure to check whether they suggest meeting upon the horizon, draw the lines as long as possible to have a reference. Now you can add the missing lines by deducting them from the existing ones. Closing your cube will provide you with the information needed to see whether you have constructed your cube adequately. You can check whether your cube is adequate by measuring the proportion of furthest rib relative to the closest rib or another horizontal point.

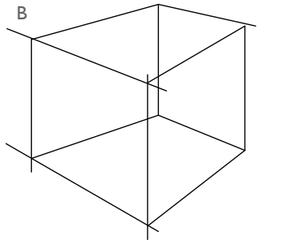
Now change the cube's position, put it on the ground to see more of the top plane, put it on a shelf revealing the bottom plane, perhaps try to tilt it to make it float into the air. While we will make extensive use of rules of thumb but practicing cubes from observation provides basic knowledge concerning proportions and directions. The Drawings on the left illustrates the relation between the observer's position, the vanishing points relative to the appearance of the side planes of a cube. (A) Frontal views yield one point perspectives (see chapter 3). (B) Slightly turned cubes yield one vanishing point close by (here left) and a mildly visible plane. Use this position if you want to focus upon a facade. (C) Visualises an asymmetrical view of the two facades. Great for naturalistic vantage points. (D) Looking diagonally yields √2 perspectives (again see chapter 3). (E) Mirrors drawing C. In outlining perspective views it is good to keep certain constructions to refer back too. Mirroring, turning things upside down provide new ways of looking at your object without having to reconstruct the grid.



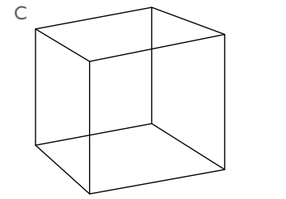
7.1.2 Points of Attention



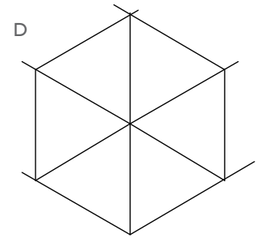
(A) has its Vp's positioned too close, which results in a wide angle effect. Strictly speaking there is nothing wrong with a wide angle effect but more often than not the cube forms the basis to be extended in several directions. Positioning the vantage points too close yields extreme foreshortening when the cube is multiplied towards the Vp's. Wide angle effects will be illustrated later on. Just keep in mind that wide angles are used when the observer is close to the object.



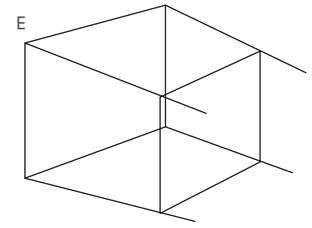
(B) has converging lines but they converge to a sloping horizon. Horizons are horizontal by default.



(c) uses Vp's which are positioned on the same side of the cube. A cube in perspective always has Vp's on two sides of the closest rib. It is a common misjudgement when one of the sides is barely foreshortened

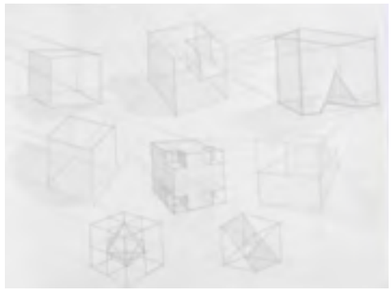


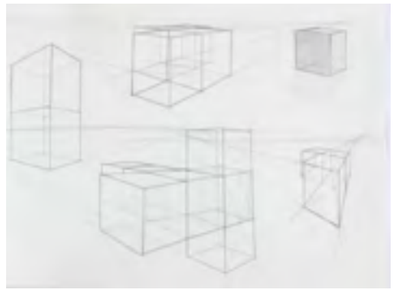
(D) is in fact a parallel perspective, the lines do no not converge but stay parallel. Nothing wrong with parallel perspective but not if your attempting to draw a vantage point perspective.

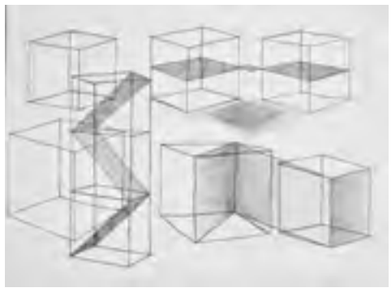


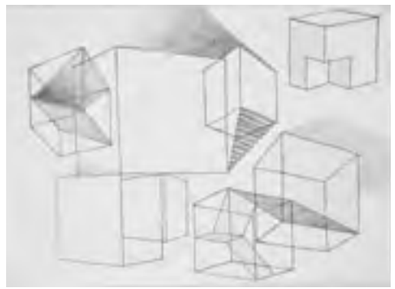
(E) uses diverging lines instead of converging ones. This is an example of medieval perspective or inverted perspective. According to the rules of perspective the lines should diverge towards their Vp's.

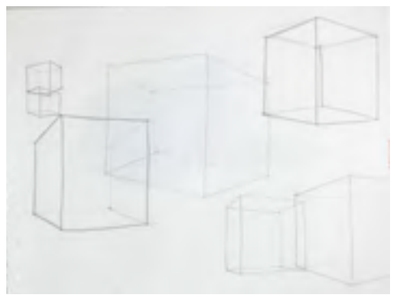
Drawing Cubes: (this page, top to bottom) Aron Swartjes; Erika Van Houdt; Naomi Schrauwen; Laura Reyniers; (opposite page) Rosa Fens

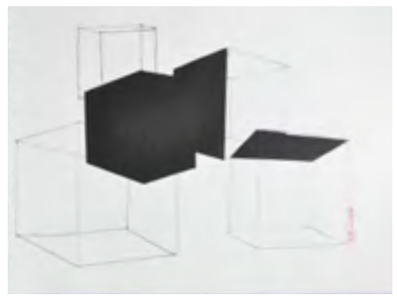


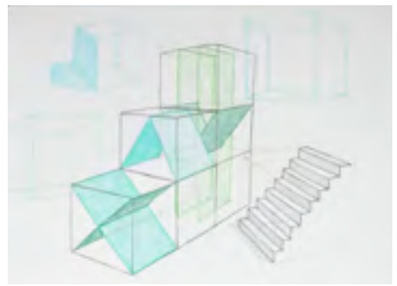


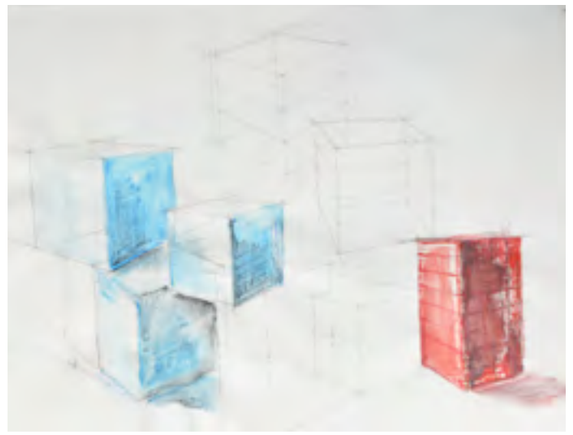


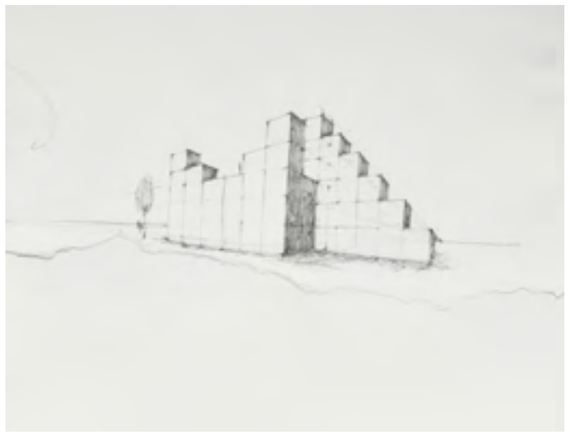


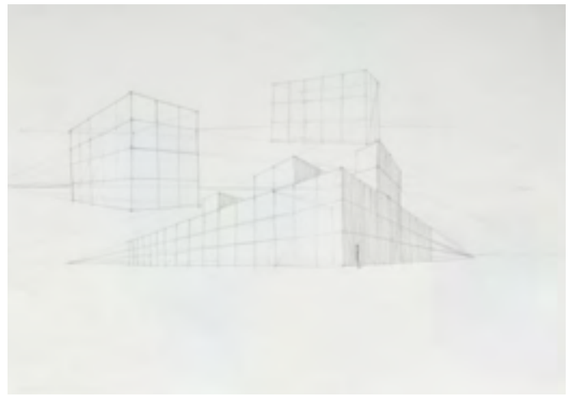


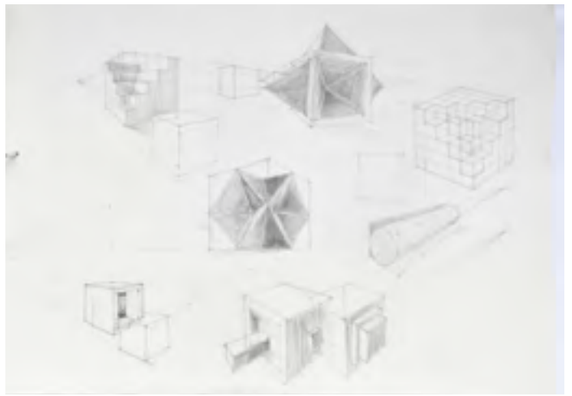












Frank Lloyd Wright: Falling Water House: Two drawings using the same principle. The top one is a two point aerial (birdseye view) and the bottom one is two point bottom up (wormeye view). You can easily flip from one to the other by turning your perspective upside down.

7.1.3 Two-Point Aerial

Draw a square as a reference for your drawing's scale. The square represents the estimated image-width. Draw a horizon line above your reference square. Slightly off centre draw a vertical line using the full height of the reference square. In order to position the Vp's use the 5 to 6 times image-width rule of thumb. This means the two Vp's are located at 5 to 6 times the measure of the reference square from each other upon the horizon line. Start by connecting the anticipated short side of your cube with a point upon the horizon. Experiment with several posittions, points close to the short side will yield a lot of foreshortening on that side, quasi symmetrical positions will provide balanced information about both sides. Avoid to position the Vp's symmetrically in relation to the reference square. Using the image width rule of thumb, this point will yield the other Vp.

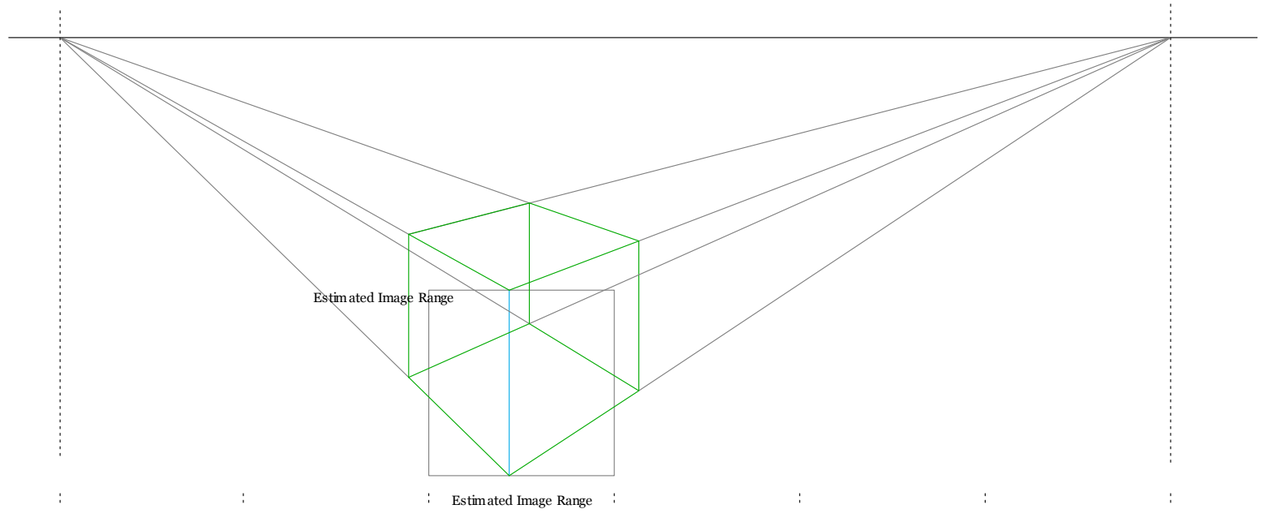
Connect top and bottom ends with the two Vp's. Estimate the depth of your cube, starting with the longest side works best as the short side is easily estimated too long, leading to distortions. From this estimation close the cube by connecting all the points. Observe your cube and check its proportions because the cube will be the starting point to construct your structure. Improve the proportions if necessary.

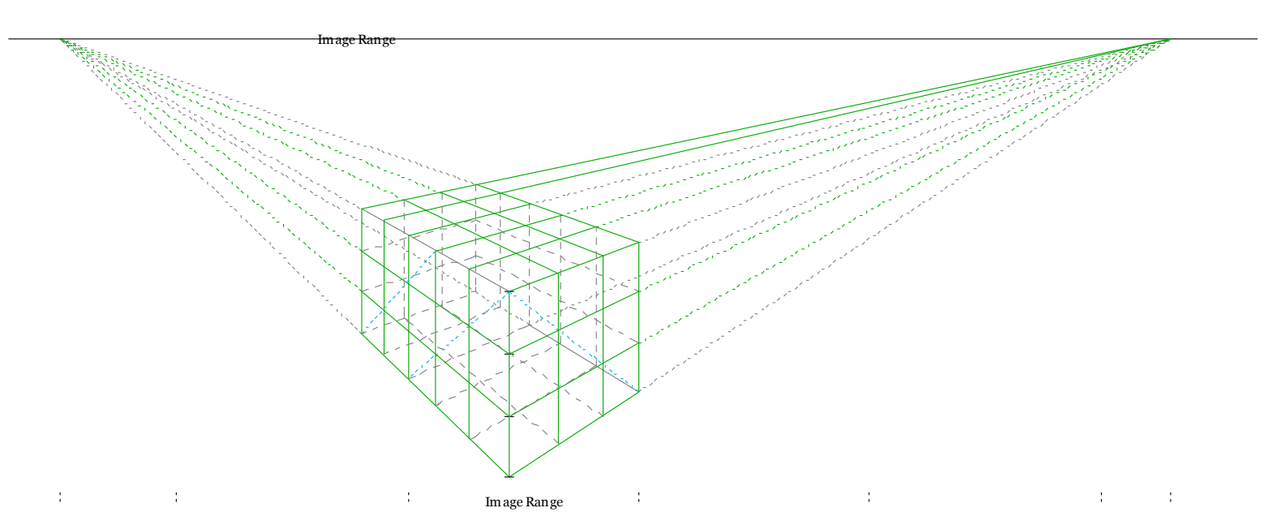
When you are pleased with the proportion divide the closest rib in three equal parts and connect those points with the two Vp's, extend the lines beyond the structure as you will need them to extend your cube. These are your horizontal divisions. Your structure is three cubes wide and depending on your design you have three, four or even more floors.

Draw a diagonal on both sides of the foreshortened cube. The intersection of the diagonal and the converging lines provide information about the (foreshortened) vertical division of your cube. Keep in mind that if the distance between two vertical divisions becomes larger when moving backwards, towards a Vp, accuracy will become an issue you better solve now, not to keep drawing with ill proportioned segments. From this segmented cube you can derive the structure's constellation.

Draw the diagonal from the perspective square at the top end downwards. Again this diagonal will intersect with the converging lines. Repeat this step until you have delineated all the cubes of your structure. To add extra cubes upwards simply add the same measure you used to divide the closest rib upwards from that rib. Connecting that point with the Vp's and extending your vertical division will yield the points needed to draw your structure.

You have now drawn the three dimensional grid to draw your structure. Start by drawing the facade elements and derive the rest of the visible elements from the spatial grid and the facade elements. You can overlay this framework with a sheet of tracing paper. That way you will be able to re-use and perhaps ameliorate the spatial grid for other drawings (by mirroring or even flipping the grid upside down).





Charles-Edouard 'Le Corbusier' Jeanneret:
two point perspective drawing of maison citrohan

Karl Friedrich Schinkel:
tow point perspective of the 'Neue Wache'

7.1.4 Two-Point Exterior Eye level

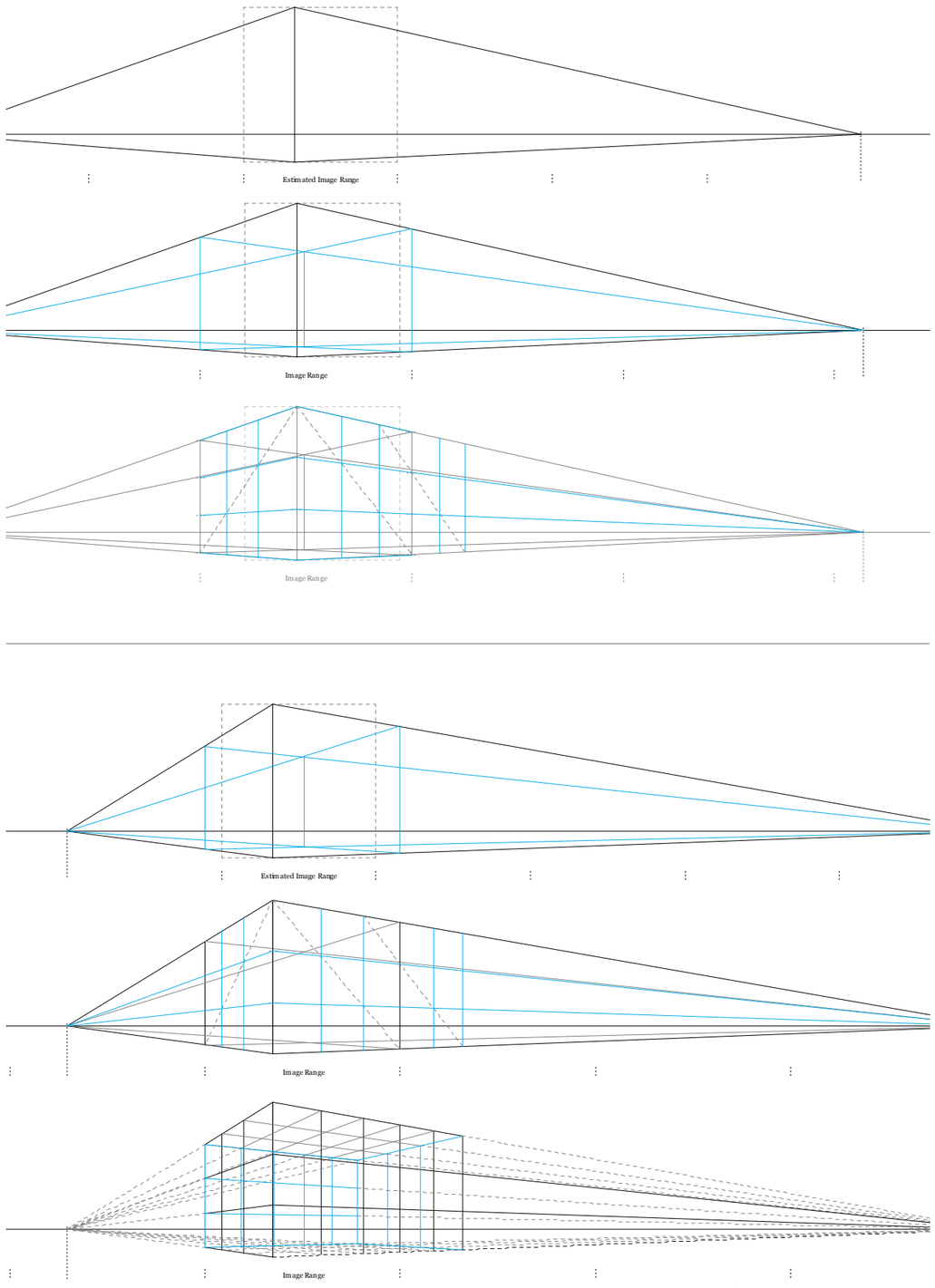
Aerial perspectives explore the three-dimensionality of your structure, viewed from above, from a helicopter, a drone or a bird. Eye-level perspectives introduce the human scale. Eye-level views show your structure as seen been by a human beholder. Eye-level perspectives use the same principles as bird's eye views.

Draw a square to discern an estimated image-width. Decide which side of the structure you want to focus on by drawing the closest rib off centre. The largest area will be the side most clearly viewed. In order to position the horizon at eye-level, divide the closest rib in three equal parts and, estimate approximately 1,65 metres at the bottom division. From that point draw a horizontal line from left to right. The width of the initial square represents our image-width to estimate the Vp's (5 to 6 times image-width from each other). Connecting these Vp's with the closest rib will provide the directions of our perspective wherefrom we will discern our referential cube. Estimate the depth of the perspective cube on the long side and check the proportions of that cube for flaws concerning its depth and general proportions.

The initial division into three parts will organise the buildup of your structure. Connect these points with the Vp's. Drawing diagonals on each side of the perspective cube will provide information upon the foreshortened vertical lines. Again extend your cube to the left (or to the right) by using a second diagonal from the top perspective cube in the back. Decide which side you intend to envision. Alternatively you can draw as doing so will provide you with a grid to draw another view.

By extending the lines towards the Vp's, and by diagonalising you can delineate the perspective grid for your structure, its basic proportions. Observe your physical model and map the facade squares onto your drawing. Try to locate yourself on a similar spot as the one you use within your drawing, looking at the model with one eye closed from a scaled eye-level. The front rows are quite easy to discern. Projection and transposing lines will enable you to situate the spatial organisation of the cubes beyond the front row. Using the perspective grid as a guide and by projecting and diagonalising positions map the other visible points – upwards, downwards and, or sideways. Using diagonals, extending certain points will provide you the intersections of spatial elements which will guide you in drawing walls and floors

In the first drawing (top) the structure's sides are divided quite equally with a slight focus on the right side of the structure. The second drawing focusses even more on the right side, enabling you to visualise more aspects of that side. In order to decide upon angles and focus points you can imagine holding a camera or create a small frame to look at your model or scene.



Two versions of eye-level perspectives by changing the position of the VP's. The top one uses a 2/3rd ratio while the bottom one uses a 1/4th ratio yielding slightly differing perspectives. Experiment with the ratios, keeping the image range in mind to reveal more or less of a side.

Graphic novelist Chris Ware makes extensive use of parallel drawn elevations as opposed to perspective drawings. He uses this perspective type for both interior and exterior scenery. (source Chris Ware (2014) Building Stories, Pantheon Books)

Giuseppe Terragni:
Two point up close of Casa del Fascio (Como)

Changing point of view, rotating around your model will change the outlook and perspective of your image. The further you are from your model the further your Vp's will be positioned. At the extreme your structure's Vp's will be infinitely far, yielding a kind of rotated front elevation similar as the perspective Chris Ware uses. Moving up close to your model will yield very short distances between the Vp's distorting the perspective. As mentioned before not necessarily a problem but something to use with caution since these kind of distortions may lead to misinterpretations concerning the scale and outlook of the structure you are envisioning.

Make a photographic study of your model to analyse the different points of views and their relation to the Vp's. Again build a studio situation and direct a light upon your model. Search for those vantage points which reveal the points of interest of your structure. Based upon this photographic study look for those vantage points which reveal your structure's formal qualities and properties. Try to analyse your structure in a creative way, think about connections and corners which aren't revealed in plans or sections and, if necessary change them.

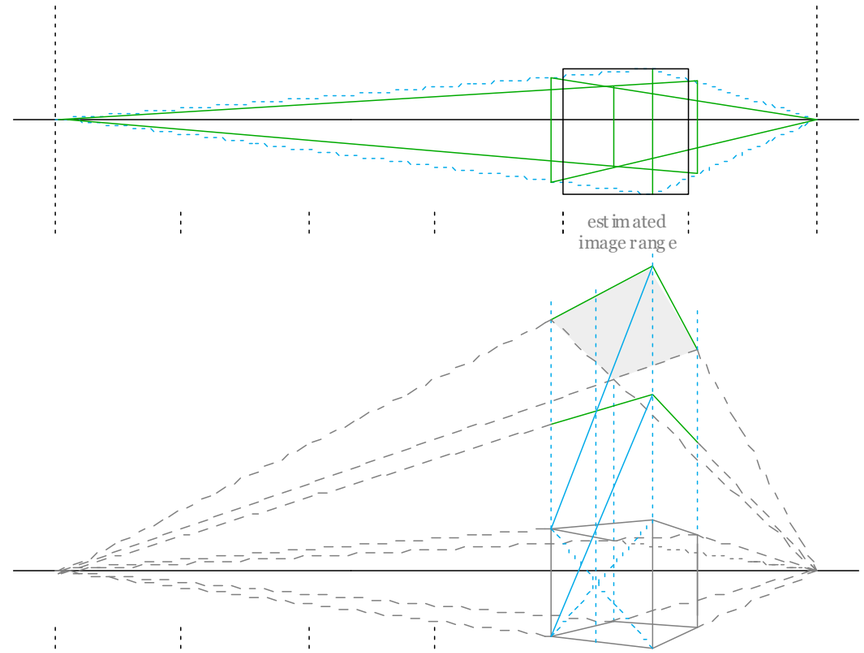
7.1.5 Two-Point Up Close

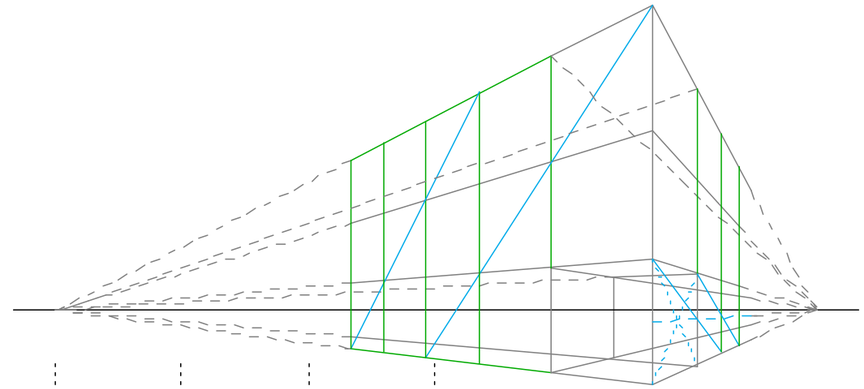
The two point, up close, can be used to visualise the approaching a building while still keeping a complete view of the building. These kinds of perspective drawings provide a more dramatic view and should be constructed with a little care because of their tendency to distort proportions, yielding warped and or twisted effects. While these distortions can be formally and visually appealing, they might give a wrong impression of the scale of the envisioned structure for either the designer and the beholder or both. The closer you get to a structure the closer the Vp's will be positioned relative to each other.

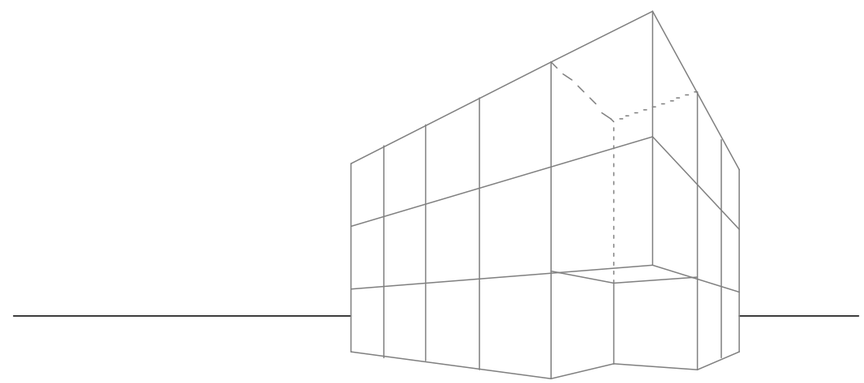
In the previous drawing you constructed a perspective grid by dividing a cube in separate squares and cubes. For the two point up close the initial cube will be extended by diagonalising it. By doing so the Vp's will automatically be positioned closer to each other providing the impression of being up close.

Again you start the drawing by drawing a cube in perspective. Draw a square, position the closest rib slightly off centre and measure 1,65 upon that closest rib. From that point draw a horizon line and position the left and right Vp's at 5 or 6 times image-width from each other. Proceed constructing the cube as in the previous drawings.

From the cube, making use of diagonalising, construct the framework of your structure by adding the number of cubes needed on top and to the sides of your referential cube. You will quickly see that the higher your structure becomes the more dramatically your horizontal lines will slope towards their Vp's which gives the impression of watching the structure more up close and upwards. Because of these effects foreshortening will also be more dramatic. From the framework construct your structure as in previous drawings. When envisioning higher structures, or when trying to convey a more dramatic perspective turn to a three point perspective. Three point perspective is explained at the end of this chapter.





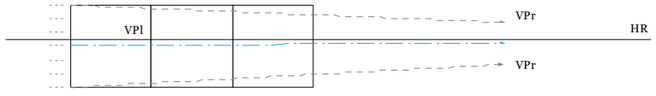


Josef Hoffmann
Two point interior of Palais Stoclet

7.1.6 Two-Point Interior

In a one point perspective you position yourself somewhere in the centre of space and look straight ahead into the room. In reality you most probably will enter a room somewhere from a side entrance, providing a more inclined and dynamic view upon the space. Using a two point perspective to draw an interior provides possibilities to focus upon the relation between the different walls, floors and planes.

Study your model, plans and sections and look for interesting points of view to draw. Look for relations between floor and wall openings revealing what is beyond the space you are looking at. Try to position yourself as far as possible in the space you want to draw, preferably against a back wall as will provide the widest view upon the space you intend to draw.

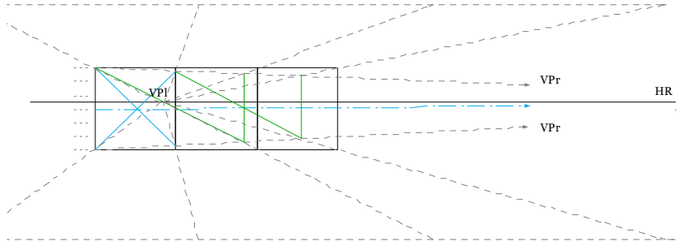


Drawing a two-point interior starts by outlining the proportion of the back wall of the space you are about to draw as an elevation. The following looks aloing the long direction of the structure, thus the back wall is therefore delineated by three squares in a row. Upon this elevation draw a horizon line. Personally, I prefer lowering the horizon in interior perspectives as they provide a more spatial view upon the space. Deciding upon the height of your horizon depends upon the elements you intend to visualise. Perhaps you want to focus on a view downwards through an opening in the floor (raise the horizon to visualise more floor area), perhaps you want to focus upon the spatiality of an opening in the ceiling (lower the horizon to provide more ceiling area). Starting by exploring your interior from an eye-level is probably a good way to start.

Your focus point will be on the Vp which is positioned somewhere upon the horizon line, in the far left or right square of your elevation. Keep this Vp off your elevation's centre otherwise you will end up with a distorted One-Point perspective.

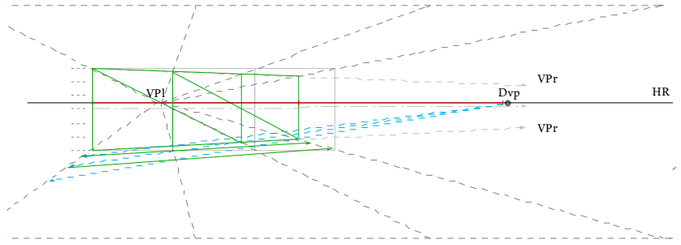
As the first Vp is positioned in your drawing the other Vp will be positioned far outside of your drawing area. It is therefore difficult to use the actual point to construct the drawing. Estimate its general direction and introduce a DvP to gain information about the space's depth.

From the top and bottom corners closest to your first Vp draw two slightly sloping lines which suggest converging in a point on the horizon. Remember that the one closest to your horizon line will be least inclined. Try to discern whether the lines give the impression to converge upon the horizon. When seriously in doubt you can always try to to extend them across your drawing area, upon your table, to check where they actually meet. It takes a bit of practice to estimate these kind of slopes but the aim is that you practise until it becomes a second nature. These lines are the boundary between respectively the ceiling and floor of your space.

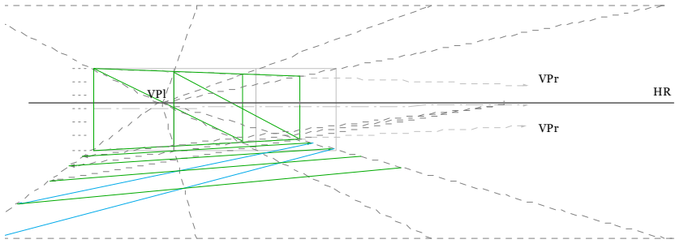


In the area of the first square draw the diagonals using these sloping lines. These outline a trapezium which will be the reference to construct the foreshortening of the wall, you are drawing. The diagonals start from the top and bottom corner of your space closest to the interior Vp which are positioned the furthest from your Vp outside your drawing. They are connected with two new points which are defined by the crossing of the opposite vertical line of the same square and the sloping lines towards the exterior Vp. Making use of diagonalising construct the number of foreshortened squares needed to delineate your structure.

Connect the perspective divisions of your foreshortened back wall with the interior Vp and extend them outwards towards the border of your drawing paper or frame. These lines will form the basis for your interior interior drawing.

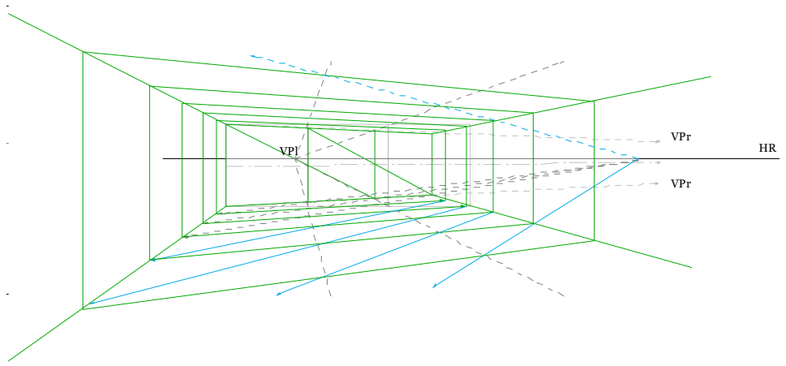


Position a DvP by measuring the total width of your original elevation. Set this distance off from your interior Vp towards the exterior Vp. Connect this new point with the perspective intersections of your back wall's division. Draw the division on the most visible plane, depending on the position of your horizon this will be the floor or the ceiling. The intersection of the diagonal lines and the lines extending from the interior Vp provide measures to outline foreshortened squares you can use to estimate the foreshortened squares of your interior drawing.



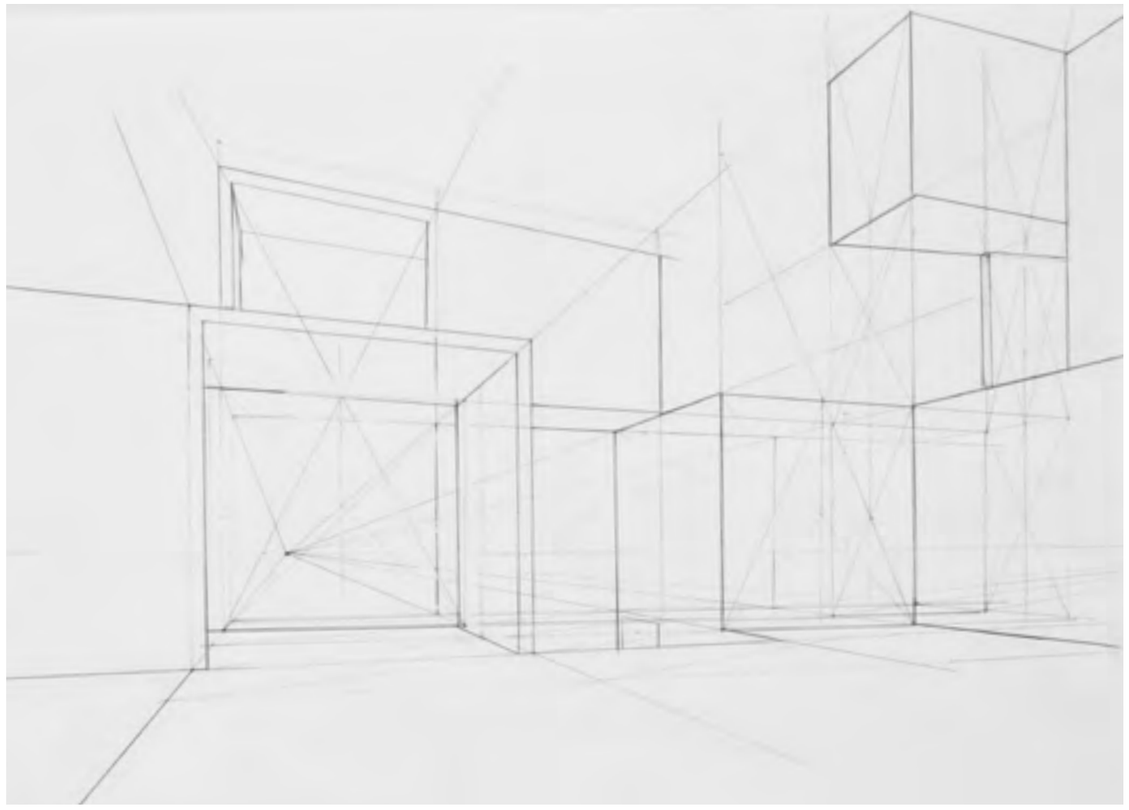
From those lines you can construct a perspective grid on the floor, walls and ceiling. You will see that the closer the construction borders to the picture's frame the more distorted the grid will appear. Keep in mind that the closest perspective square is, essentially, the point where you are standing and will always be distorted. Next to that remember that the horizontal width of a perspective square should not be longer than the height of the shortest beam.

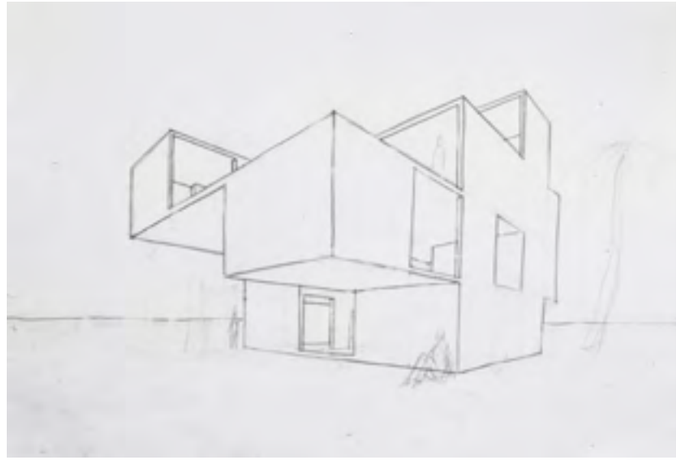
Interior perspectives aim to convey an immersive effect, that is the impression that you are surrounded by the space you are visualising. While constructing the grid you will see there will be a point where you are are unable to close the closest squares of the grid, that will be the boundary of your drawing. When the depth of the grid offers only a few perspective squares to draw your interior, you are left with two options. the easiest way is to extend your interior beyond the back wall by using diagonalising. The other option is positioning the DvP further away from the interior Vp but this will also result in a flatter drawing.

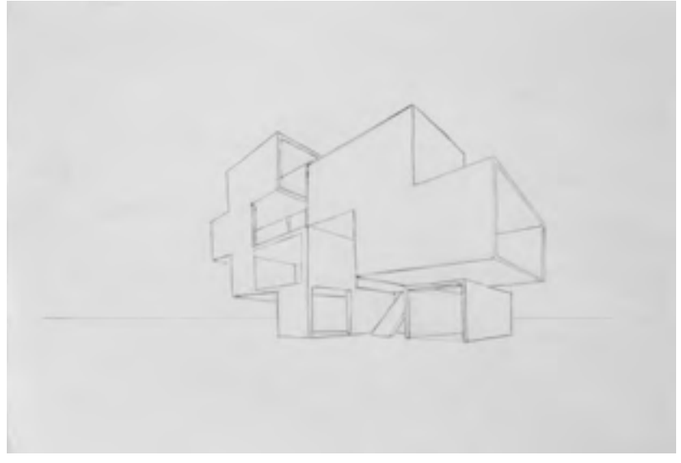


Using diagonalising you can extend the back wall of your drawing upwards or downwards. You will need this information to draw upper or lower floors which can be observed through the openings, from the point of view you are positioned. Using extensions of the perspective grid you will find the necessary points needed to suggest the upper or lower parts of your structure. Accentuating the horizon where a window or a vista is positioned will suggest the transparency of a window. Explore your inner structure by using this method. Look for other interesting points of view, specific locations. Sometimes it takes a bit of tinkering with Vp's and horizons in order to find the right spot to draw a certain view. Remember you are sketching about, this kind of exploration enlivens the drawing, making the searching explicit.

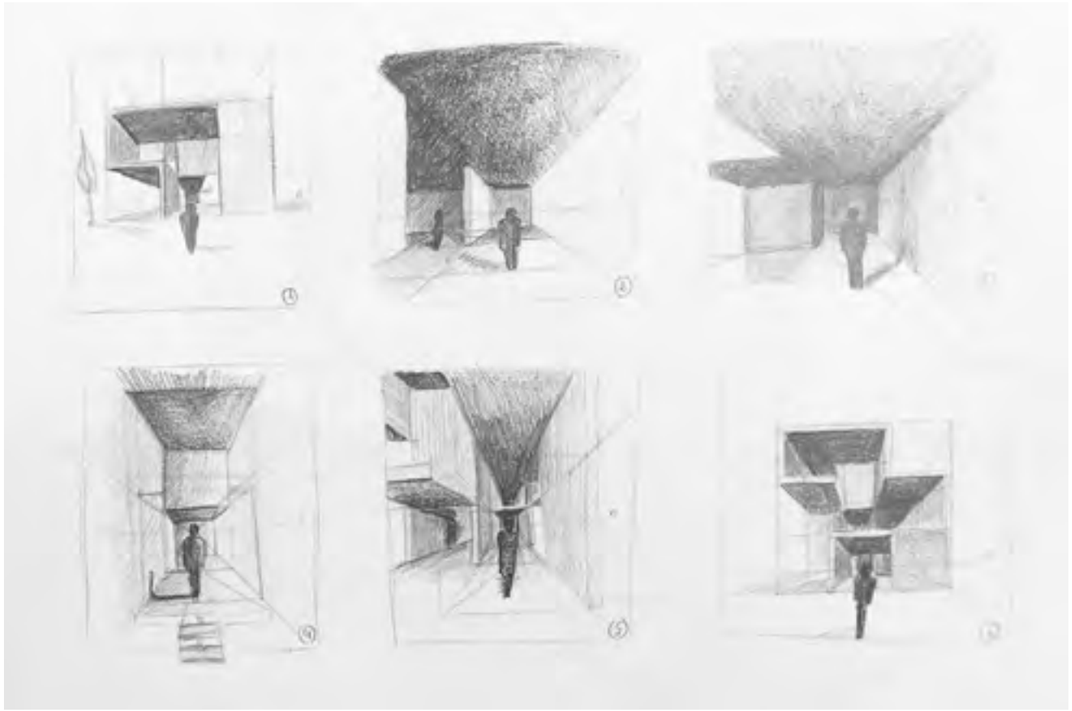
By fine tuning this division you can add proportional information to further tune your perspective to draw the stairs and eventually furniture elements and human figure. When you have drawn the horizon at eye-level all the (grown up) heads will coincide upon that line. When the horizon is lower they will be higher and correspond to perspective foreshortening. When you have positioned a figure in such a drawing you can estimate this foreshortening by connecting the top and bottom with the interior Vp. Then you can move the figures around using the lines parallel to your point of view. Experiment with human figures using copies of your drawings.

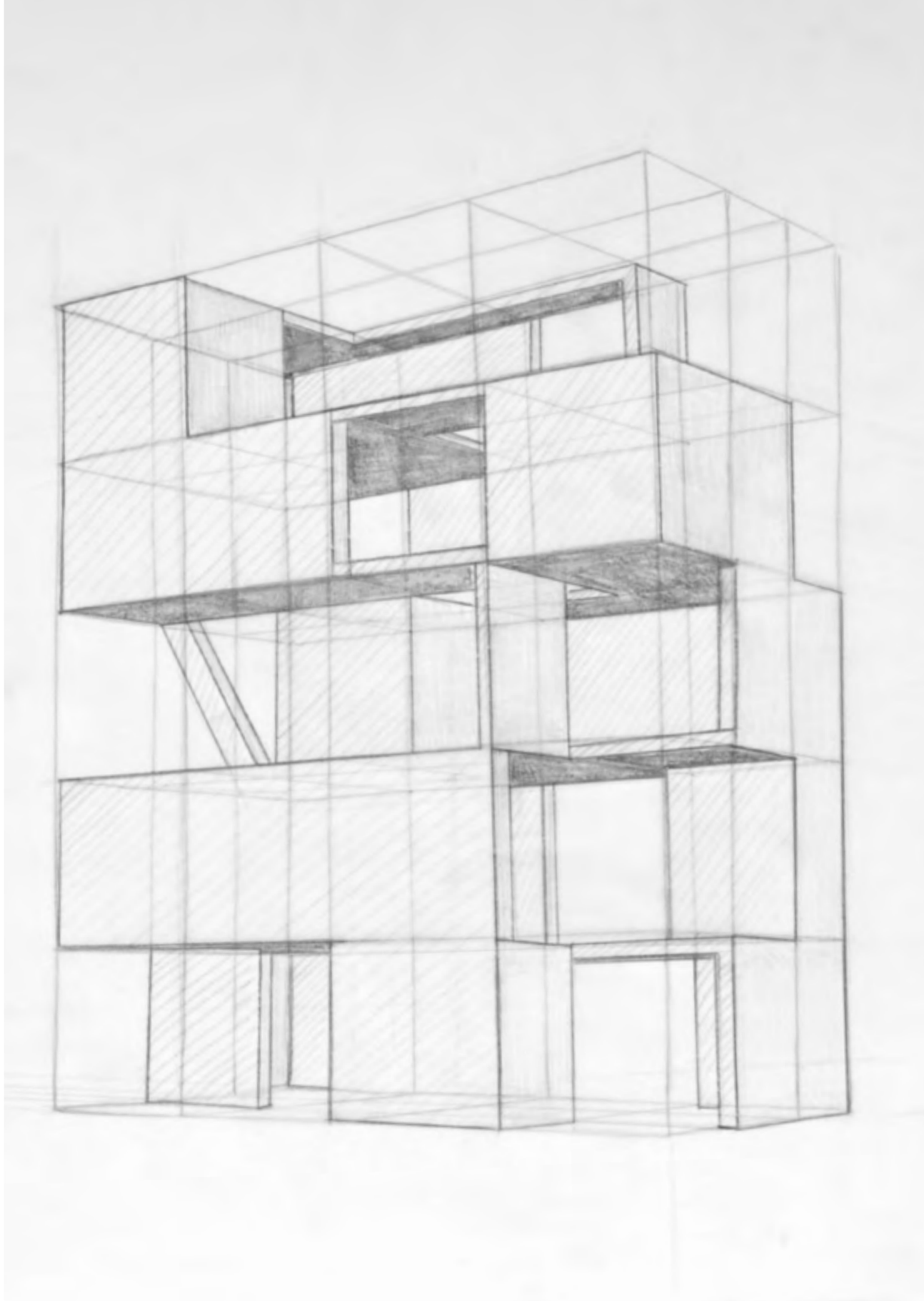


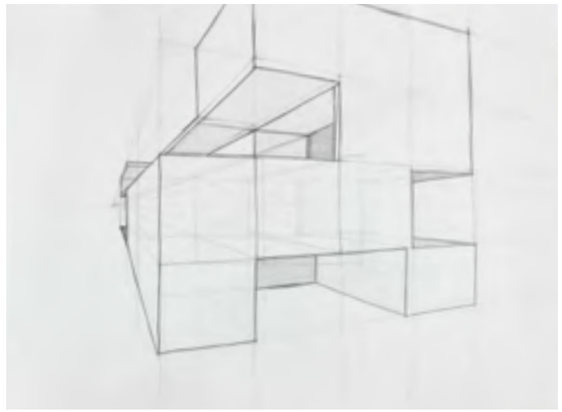
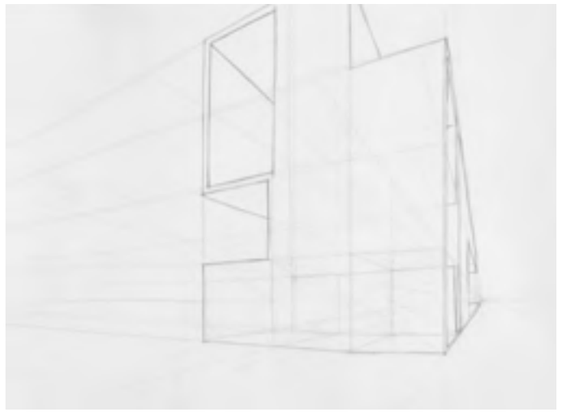
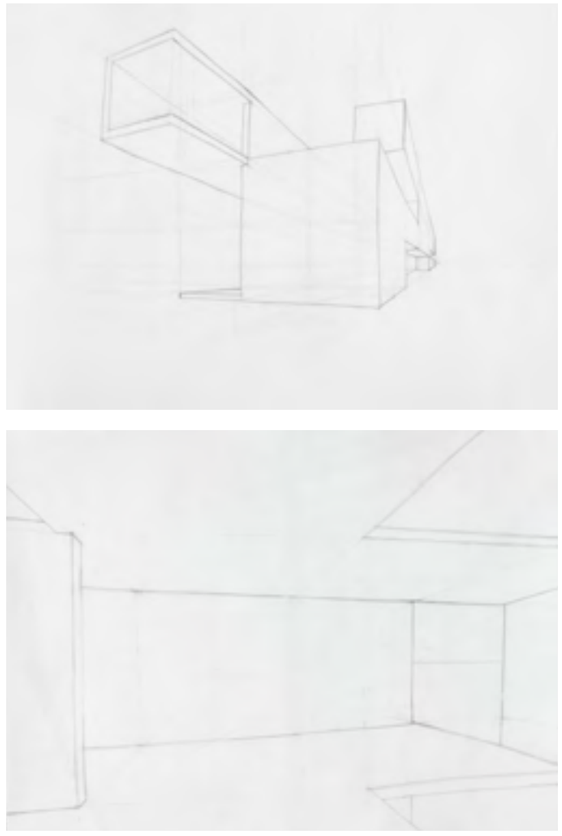
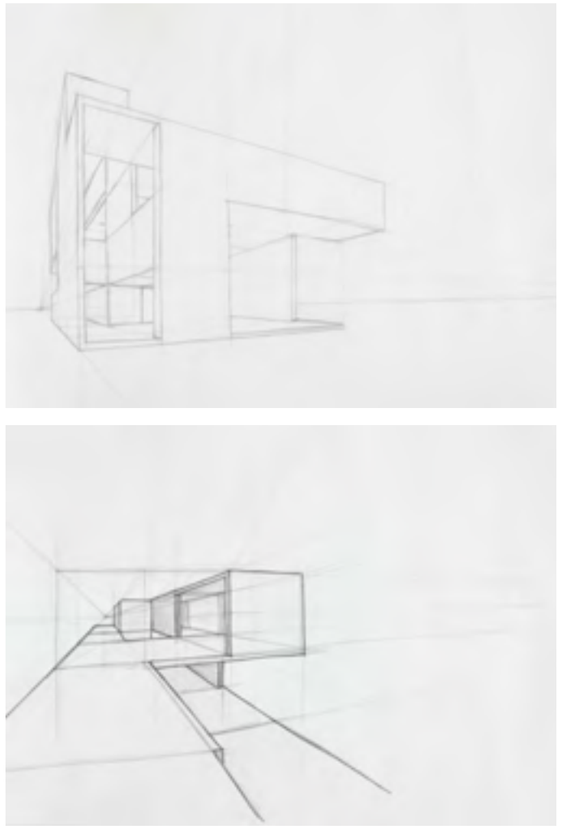


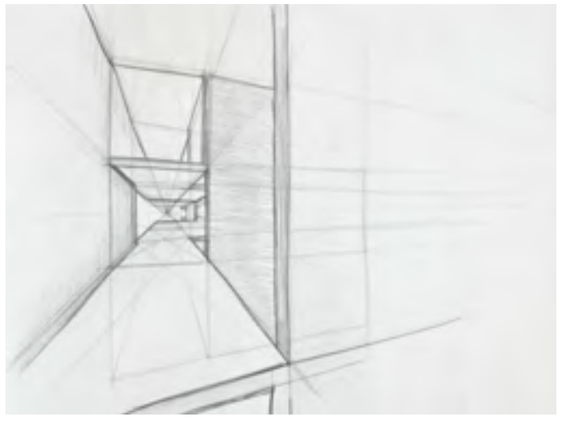
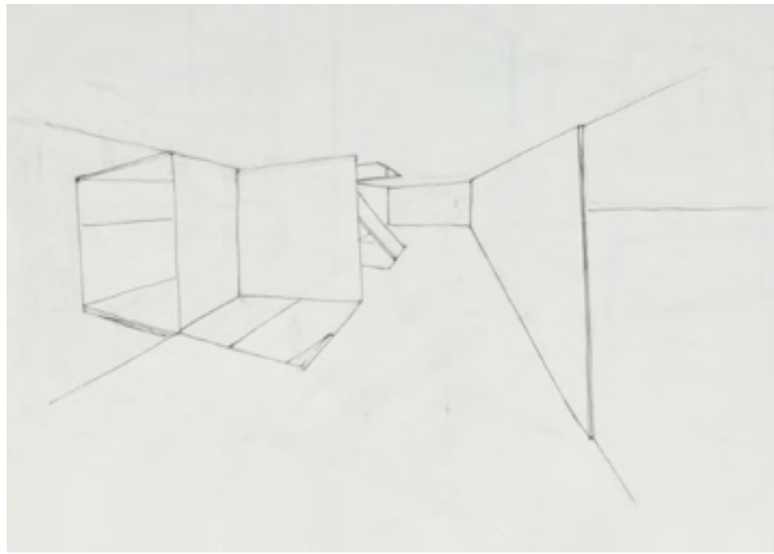
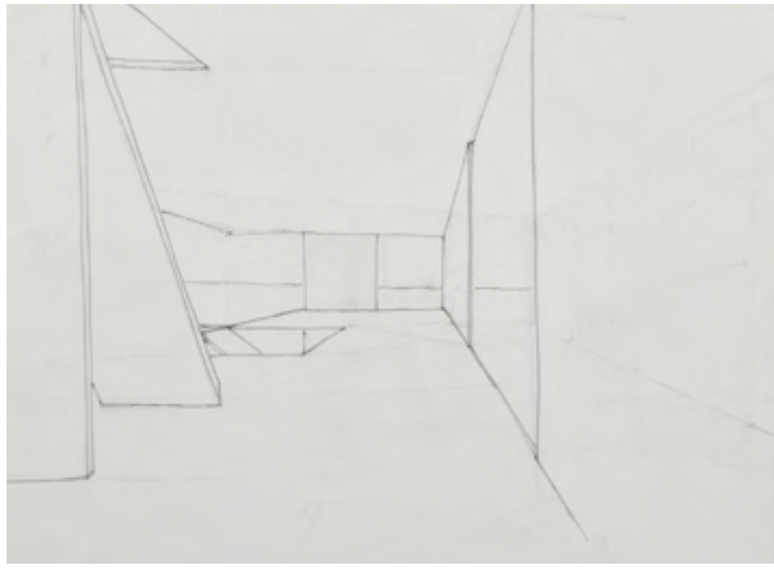
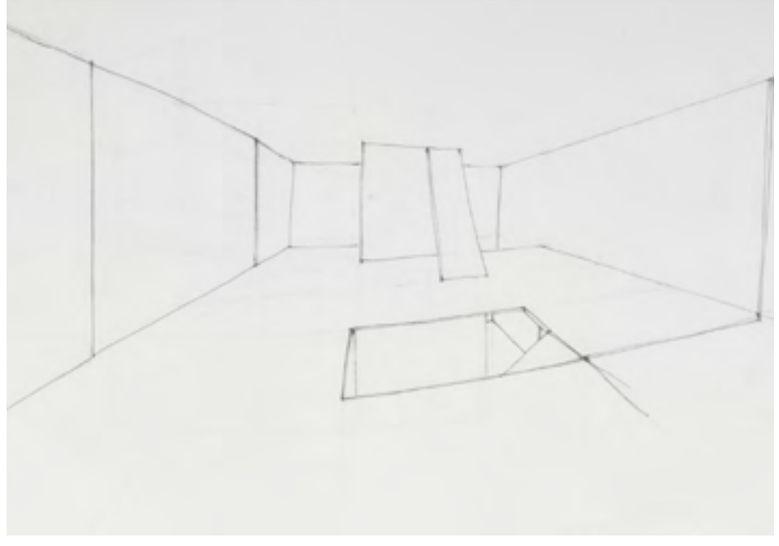


constructing two-point perspectives (opposite page) Kaatje De Boelpaep (this page top to bottom) exploring the final framing of the images: Davina Decoster; Up close perspectives (slightly distorted) Melissa Denis; Kaatje De Boelpaep (next page, left) exploring the interior in a set of 'thumbnail' sketches (smallscale sketches) Melissa Denis; constructing a two-point perspective (Rani Couckelbergs); following page, (left) exploring a series, Aron Swartjes; (right) exploring interiors, Rosa Fens



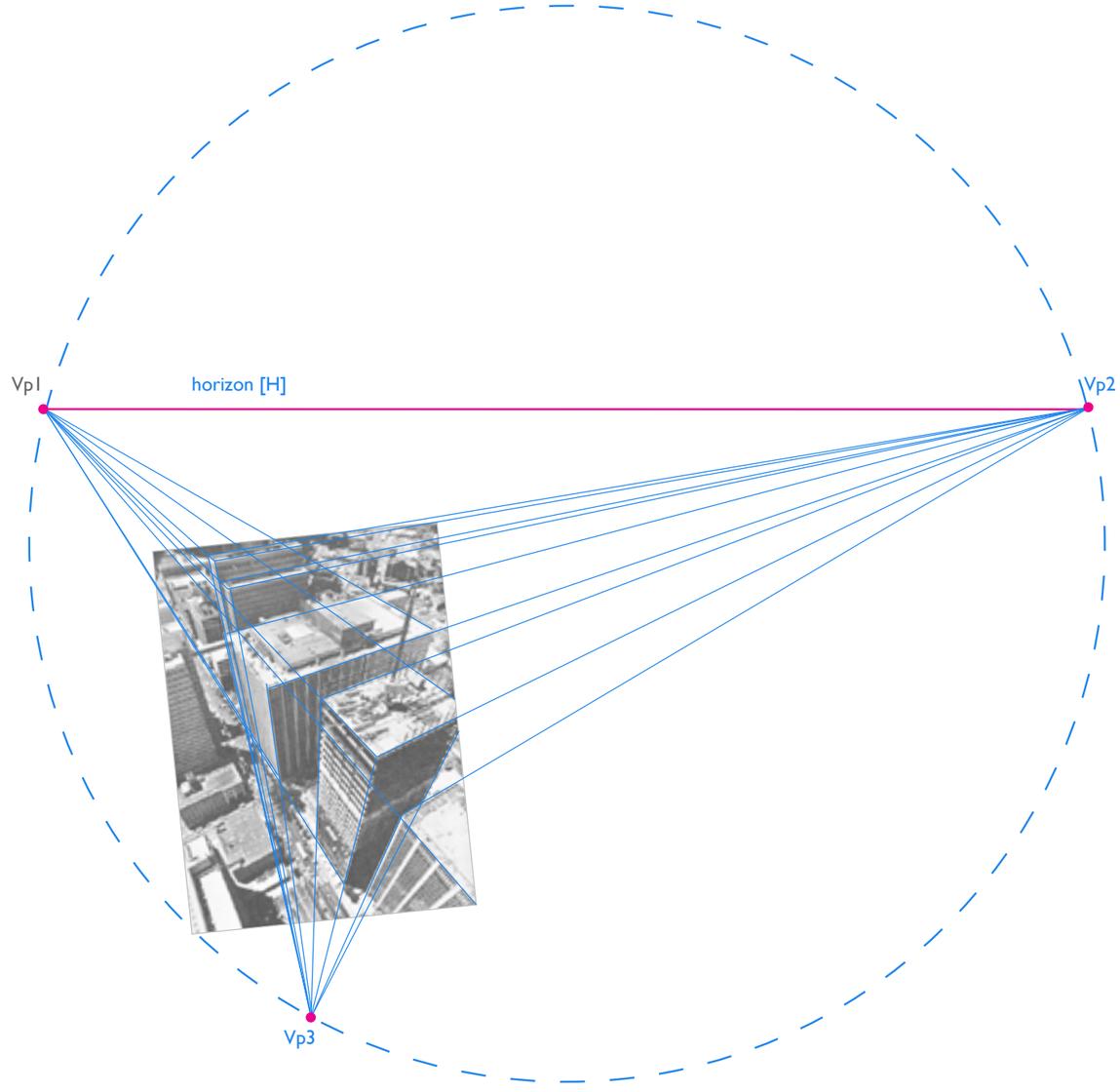


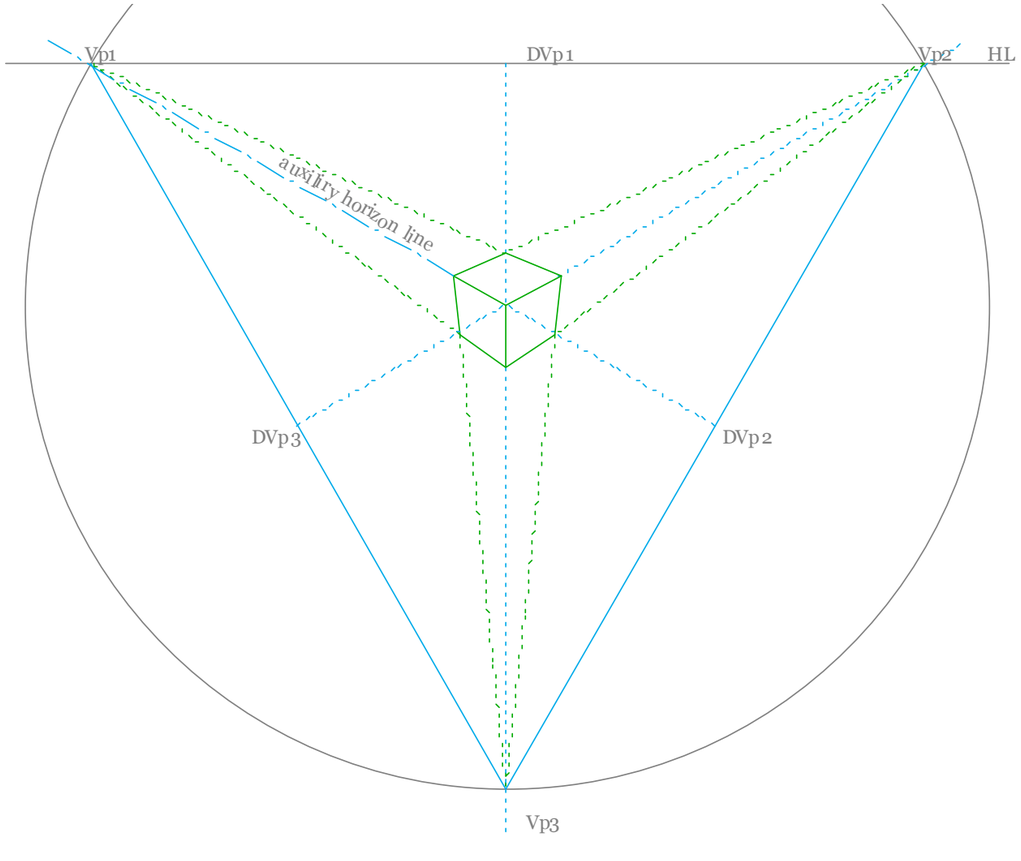






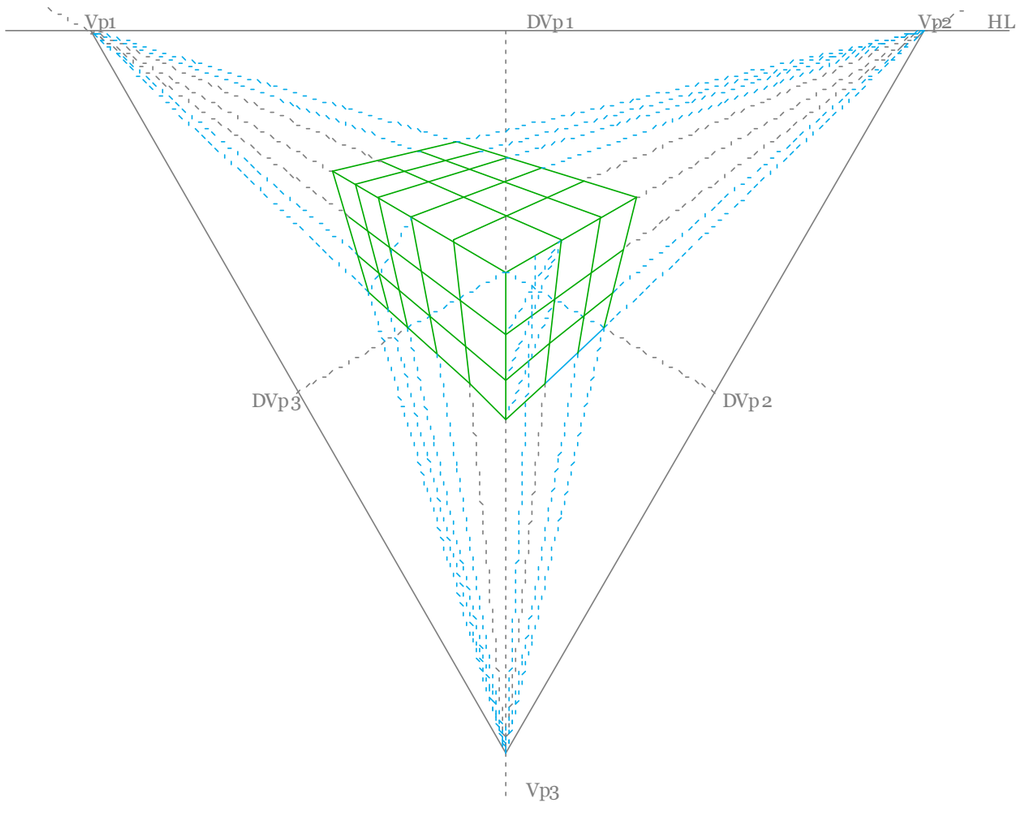
7.2 Three Point Principle

There is a point where two point perspective becomes so distorted that it tends to damage the image of the structure you are drawing. Three point perspective provides a way to deal with these kind of distortions. To experience three point perspective you have to approach a (preferably tall) building. Position yourself in front it, and look upwards. Now take out a pencil or something to measure the lines of the building. You will observe that next to the horizontal lines the vertical lines will also converge towards a Vp, upwards. A similar effect occurs when watching downwards from a tall building or from the sky.



A bird's eye view displaying a three point perspective. (from handprint.com; http://facweb.cs.depaul.edu/sgrais/SpacialPerspective.htm, accessed june 2015)

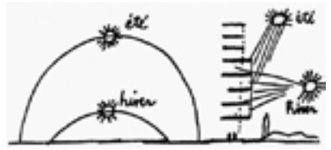


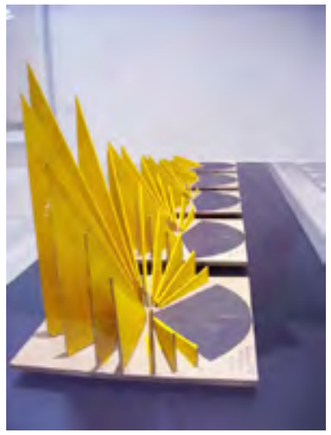


The diagram on page 110 illustrates a three point perspective construction departing from a circle construction which provides the lead for the closest rib. Be careful not to draw the circle, and the Vp's too close to each other, drawing the cube too large relative to the circle will yield disproportional sloping lines. Positioning them far away, drawing your cube to small will minimise the effect of the third Vp. The centre point of the circle is the top of your structure. Using the three DvP's provide the references to draw a proportional cube and by diagonalising the planes you can easily construct your structure in three point perspective. Remember that everything you position in your drawing will have to oblige to the three dimensions. Vertical lines converging to the bottom Vp and horizontal ones to the left and right ones.

8

3D modellingII





Charles-Edouard 'Le Corbusier' Jeanneret: Sun Paths based upon summer and winter situations. The summer sun raises higher yielding steeper rays of light compared to the winter sun. As a rule of thumb you can use a 45º angle for a midday summer situation, and a 30º angle for a midday winter situation.

From the digital 3D model we have processed we can now start extracting perspectives and explore basic rendering. MWMWI will limit rendering options to adding (minimal) colour and sunlight. In the previous chapter you have explored perspective drawing freehandedly. Now you will produce a set of perspective drawings by using digital modelling.

One of the great advantages of freehand drawing is that you can change aspects and/or portions of your drawing as the drawing evolves. You can even exaggerate certain effects by enlarging or minimising them or quickly ameliorate flwas within a drawing as the drawing evolves. You can draw different scales next to each and switch from detail to siting as your drawing and thoughts move along.

Digital drawing and modelling comes with its own set of advantages. Digital modelling, once you have built your virtual model, can very quickly generate several points of view based upon the same model. These views can be saved in preset views. Deciding to change something results in changing the complete digital model whereupon you can check the changes in the preset views. Both activities offer the designer points of view to explore, assess and express design. The bottom line is, essentially, you do not want to compare them but use them alongside each other. You can easily print out a digital model whereupon you can add details, colours, textures, human figure and eventually mark structural changes. Depending upon the time available you can use these drawing or re-process the changes within your digital model.

Draw a large rectangle around a top view of your digital model and extrude it a few centimetres. This will be your ground surface. To avoid that this ground surface blends with your model switch to front or side view and lower the plane the number of centimetres you used as its extrusion. Adding a ground surface offers a plane whereupon the cast shadows will be visible. Create a light and position it in front of your model, diagonally 45º downwards and upwards relative to your model. If necessary specify the light's setting to 'sunlight'. (add diagram)

Select your whole model and choose a light colour (*white-ish*) for its exterior walls and floors. Lighter colours will provide a better indication upon shadows than dark ones. As you proceed to develop your model you can gradually alter the colours as you see fit.

Position a camera outside, somewhere in front of the model, at eye-level and define a perspective view and an angle (camera). Render the view to see what happens. When you position yourself around or within a 3D model be aware of the lighting effects. Backlit scenes will not convey a lot about formal qualities of your structure as they will show a structure residing in the dark areas of its own shadows. Remember that it is the shadows which enliven an object. So with every viewpoint you define make sure to take the direction of the sun into account.

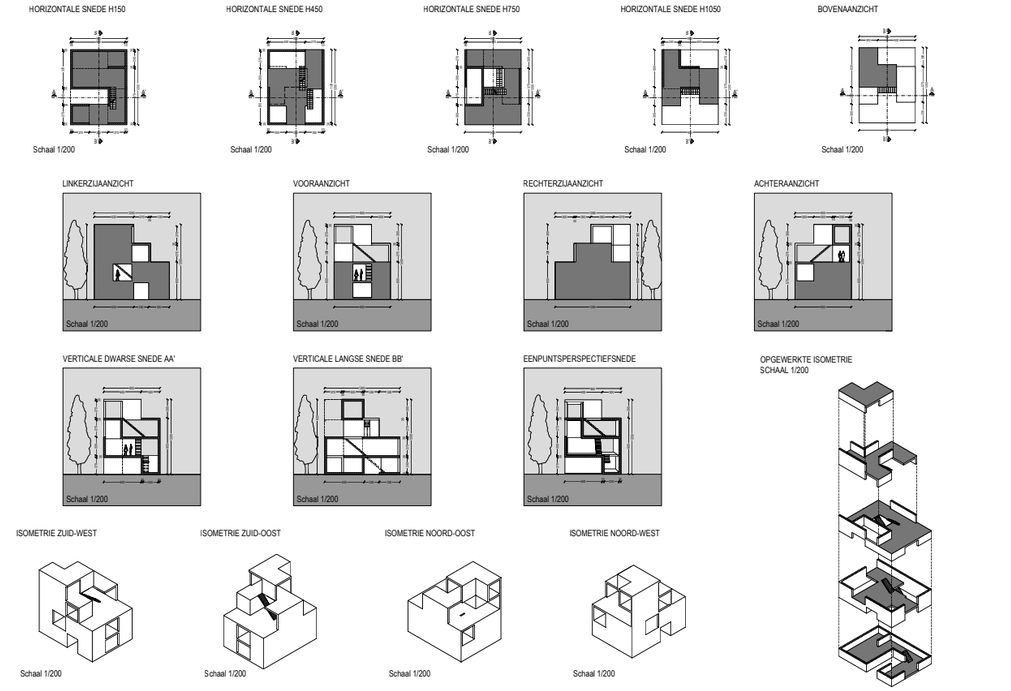
In architectural drawing the sun is conventionally positioned on a 45º emulating a midday sun but as the day evolves the sun takes different positions and angles. As you define angles of observation and vantage points make sure to play with these aspects to reveal the most of your model. While it is very easy to change the position of the sun within a 3D model try to be consistent with its original position by emulating movement over day rather than randomly moving around your object or the sun. In real life architectural structures and sun positions are fixed.

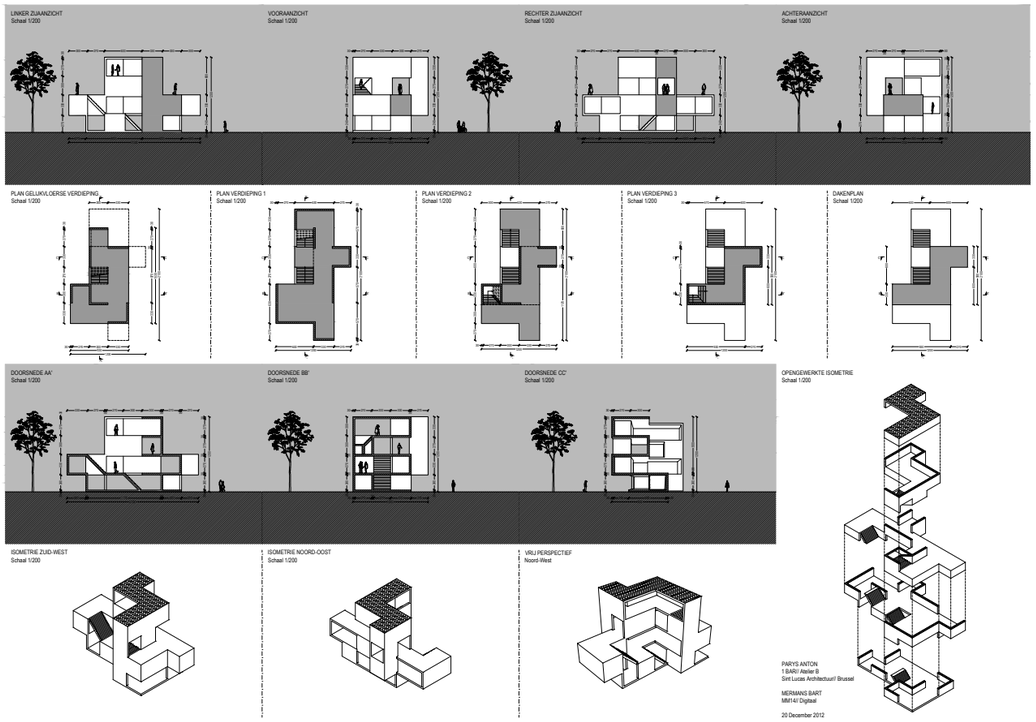
Based upon the previous insights start exploring your model by entering it, experimenting with different cameras, lenses and points of view. Make sure to save the best positions in a preset view so that you can return to them. As you proceed study your model for spatial and lighting effects, if necessary change the model based upon these explorations.

Play around with different possibilities, remove a wall, a floor a ceiling to see what would happen while keeping the model's basic constraints in the back of your mind (your model makes use of the outline and circulation route as the solid structure, every room is accessible and has at least one square window). Repeat the exercise you did while exploring one-point perspective. Entering the structure and walking through your structure. Use your physical model to discern interesting views. Try to look upwards or downwards to reveal specific sights. Enter every room to define a sequence which goes from entrance to roof level. Again do not forget to save your views in a preset view. Finally print all your views. From this exploration select some four exterior views and a set of interior views. Try to explore these views you have not drawn within the previous exercise.

Robbe Roggemans

(this page) extended interpretation of the folded model, visualised as an inhabitable structure (as drawn by colleague Willem Vandeputte) Descriptive presentation based on a prepared template featuring plans, elevations, sections, 3D images and exploded view (top) Nomi Deschuyteneer; (bottom) Anton Parys





9 analysing – finalising

9.1. Analysing

The remainder of the workshop will produce an integrated presentation of the structure by using a mixture of digital, physical and photographed files. First of all you will have to archive all the elements you produced by gathering the drawings, printing the digital files on a 1:200 scale as well as printing the photographs and key renders of all the models. Organise all these elements chronologically, fixing prints and odd scraps of paper onto A3 sheets of paper. The chronological organisation represents the account of the development of your final structure, its sketching process, its modelling process, its form, its spaces. Study all the elements and select your favourite views, drawings and photographs. When looking for the right images and drawings keep in mind that all the images tell the same story: the story of your developing construct and its final form.

9.2. Finalising

Check whether all the images display the same proportions, the person who will be analysing your drawings will want to know how large or small the construct will be, what kind of rooms it contains, how to move about. Check whether all the drawings tell the same story, architectural communication is about accuracy, you do not want to confuse a client or contactor. While subjective sketches and conceptual marks definitely have a place in your presentation, if only to reveal a hint of signature, they have to be complemented by a set of drawings which describe your construct as accurate as possible. Mont human silhouettes or figures in your drawings as an indication of scale, draw a horizon line and if wanted, animate that horizon line by adding trees, roads, light poles and what not. Do not over do it, the drawings are about the construct, not the surroundings. Using tracing techniques you can ameliorate certain discrepancies if displayed within your selected images. Select a total of six to ten perspective drawings, finalise your plan set and select a few photographs of the final model. They will all be used to edit an integrated presentation.

9.3. Expressive Excursions

The plan set will be drawn on an A2 sheet of paper (two A3's which can be folded together). Check your plan-set for inconsistencies relative to the latest version of your structure. Check line weights, hatches, text&typography, measurements, titles, marks and references, ... Amend your printed plans, using a blue pen. Proceed studying with the pen rather than turning to the computer to immediately repair certain aspects. Constantly switching between print and screen will divert your attention from the drawing to the digital file and vice versa resulting in incomplete assessments of one or both. When you have marked all the inconsistencies concerning the drawing, the typography, the composition turn to your computer and start processing what you observed, marking all the improvements out with a red pen upon your physical print-out.[32] The plan-set will include the plans, sections, elevations and the exploded view. Check your drawing by printing until satisfied with the print and resolution. Printing on a heavier paper will yield more qualitative results compared to using standard printing/ plotter paper.

Next to the plan-set select and prepare some six drawings which will reveal key perspective views of your structure. Select from all the drawings you prepared a series of drawings which, combined, convey the full spatial quality of your structure. Do not worry about the quality of the drawing as you can improve them. Select one or two one point perspectives (as your folded uses the same circulation route the views can easily be changed to include that information), use a few two points of the exterior, some two points of the interior and perhaps an isometry or sectional one-point. Copy those drawings upon A3 sheets of paper. You can either enlarge them or even scale them down for composition reasons. Study the prints and ameliorate perspective distortions or other mishaps upon the print. Erase certain stains or lines you do not need by using erasing fluid or white paint/ ink. Alternatively you can use an A3 sheet of tracing paper and trace the ameliorated version of the drawing to provide a clean drawing which you can copy.

The selection will be used to explore rendering and colouring explorations. The following provides a few indications to proceed. You can choose any technique but every new series of drawings should explore a different technique.[33] A series consists of six or more drawings which is executed in one medium. The idea of the session is that you discover, practise and embody the peculiarities of a technique by executing the technique more than once. In repeating a technique you will become acquainted with its qualities by doing, by experiencing. The following list provides an indicative focus for each series. Be aware that some techniques can take a great deal of time to execute and to perfect. Try to alternate between intensive and easy or quicker techniques. Before you plunge into a series discern whether certain activities can be automated, especially when using 'wet' media. Floors, walls and ceilings, for instance, can be coloured in a series. Start by colouring all the floors on the series and by the time you finished your last floor your first one will be dry whereupon you can proceed to the next element. You can also combine techniques in order to arrive at quicker results. Finalising a set of drawings for presentation is always dependent upon three factors: the time left, your notion and abilities of several techniques and their anticipated consumption of time, the availability of resources. Copy the drawings seven times (providing a back-up during the rendering experiments).

First Series : Shadow [this series will map the core shadows and cast shadows for all your drawings]

Second Series: Colour + shadow [based upon the information of the previous series this series will add tones of colour]

Third Series: Textures + colour + shadow [combining colour and texture effects this series will focus upon a tactility of the surfaces]

Fourth series: Context + textures + colour + shadow [This series will start exploring the outside, where is your structure based, introduce trees and atmospheric effects]

Fifth Series: Human scale + context + textures + colour + shadow
Finally human scale will enter the series, make sure to introduce more than five figures, perhaps even pets and animals, children even. Be aware that 90% of architectural representations use (super)models, skaters and fancy cars. Perhaps you should not? Human figures add a sense of scale but also provide an atmosphere and a hint of the draughtsman's preferences, try to tell a story people can relate to.

Sixth Series: Open (try whatever you would like to try, explore the extra ordinary, try something different)

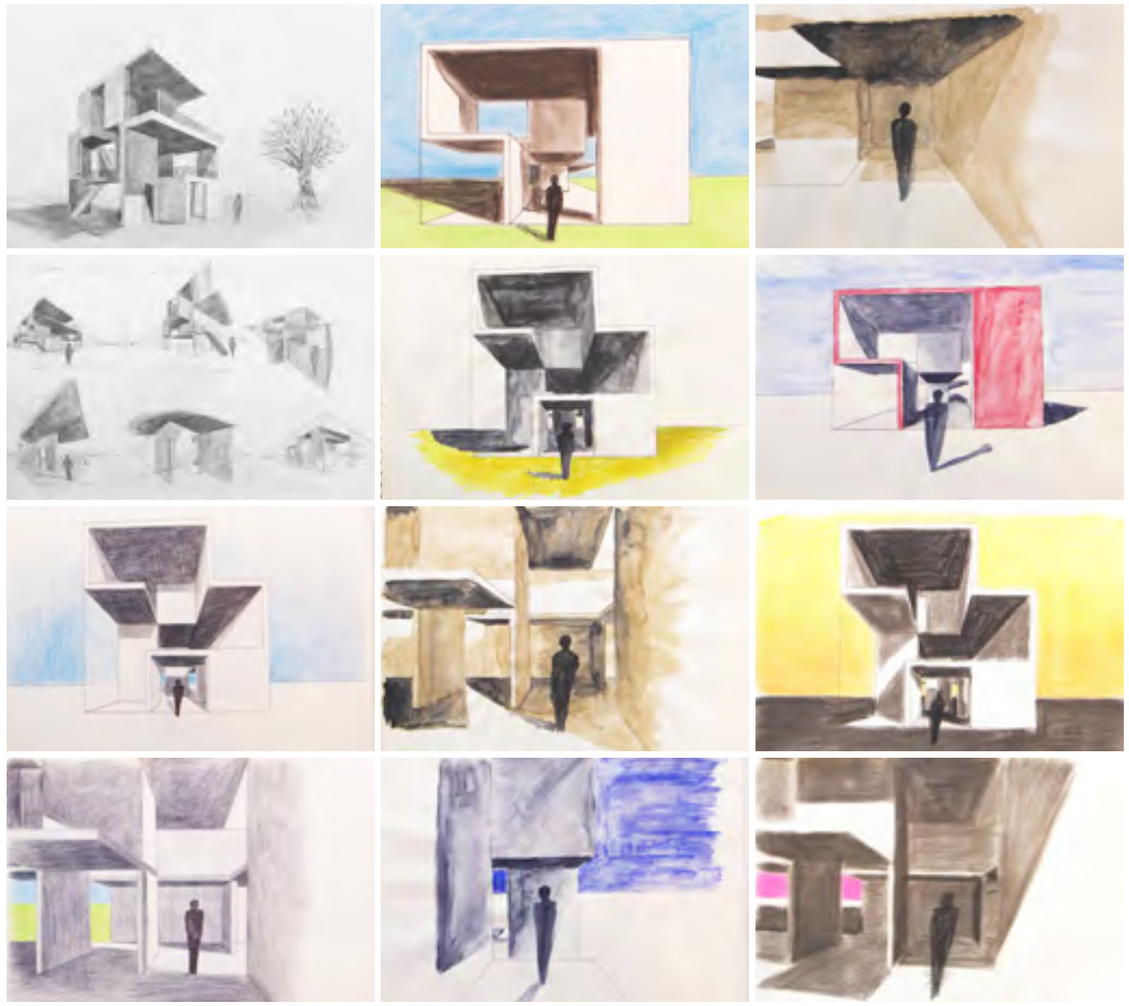
9.4. Communicating

From these expressive excursions select those drawings which best express the essence of your construct. You can use one series or choose amongst several ones. Keep in mind that when changing atmosphere, you will have to avoid confusion, avoid that the reader has the impression looking at several constructs as opposed to one. Crop them, scale them (using a photocopier or digitally) and mount them on a A2 sheet of paper. Select a series of photographs and mount those on a different A2 sheet of paper. Make sure to use the same orientation as your plan set (portrait or landscape).

Finally take your printed plan and using the most convenient or appealing colouring technique render your planset. You can make the walls solid (black) or mark them by using a thicker pen. You can colour the floors in the plans or even use collage technique to convey a certain material or texture. Add light shadow effects to your plans, sections and elevations to convey the three dimensionality of your structure. Add human figures and vegetation to your sections and elevations. Add a backdrop, a colour or a texture to indicate the sky behind your elevations and, eventually sections.

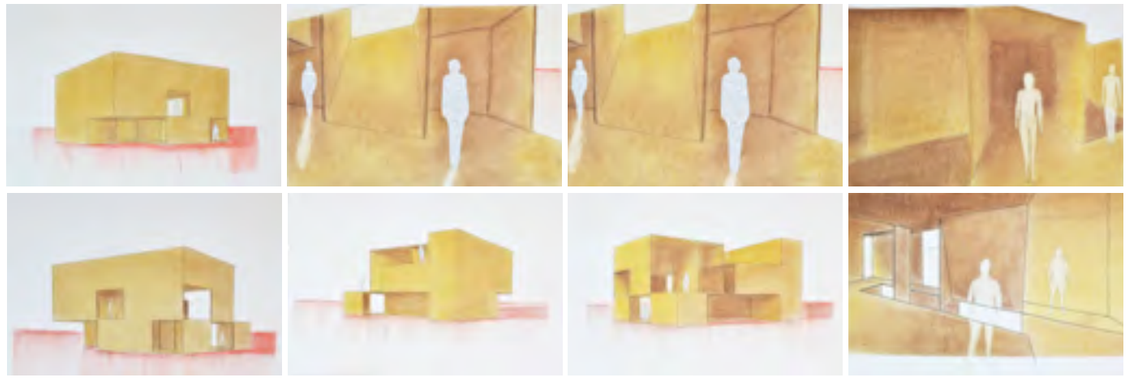
Put the three A3's together in such a way that they form a triptych, a consistent whole made up out of three panels. Together with your model the tryptych will communicate your final construct. Bundle the process, all the drawings which make up the development process in a separate bundle to keep as a record of your process.

10 **images-examples**

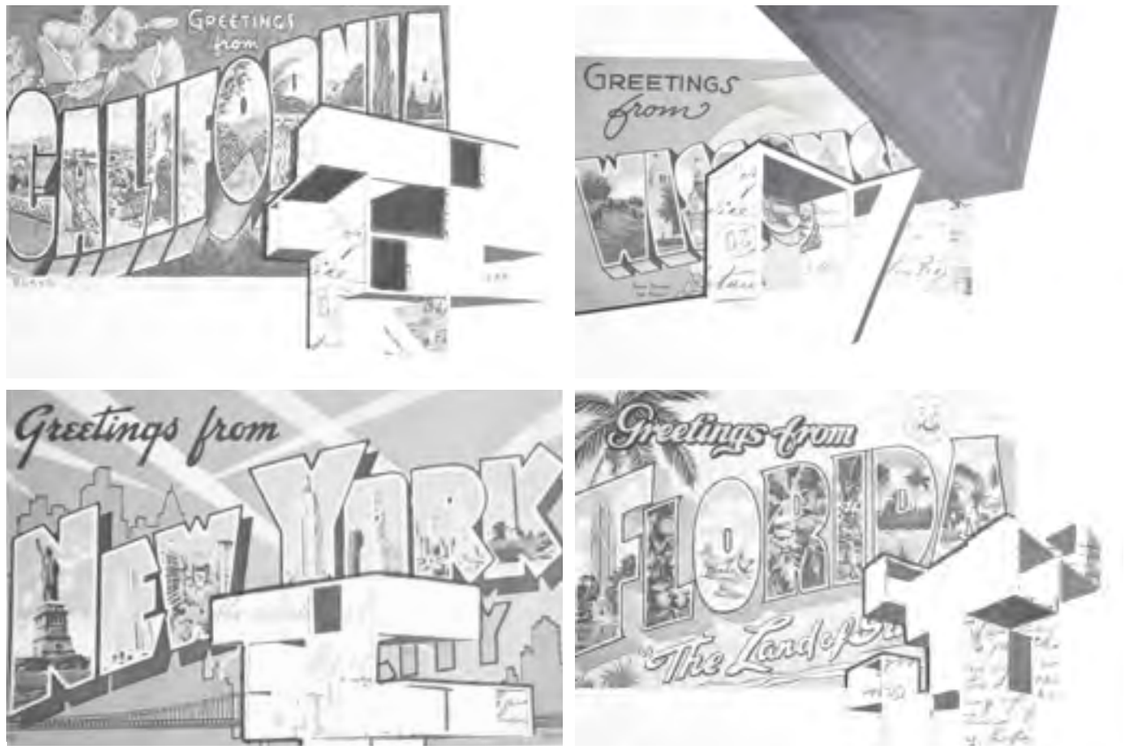


Melissa Denis

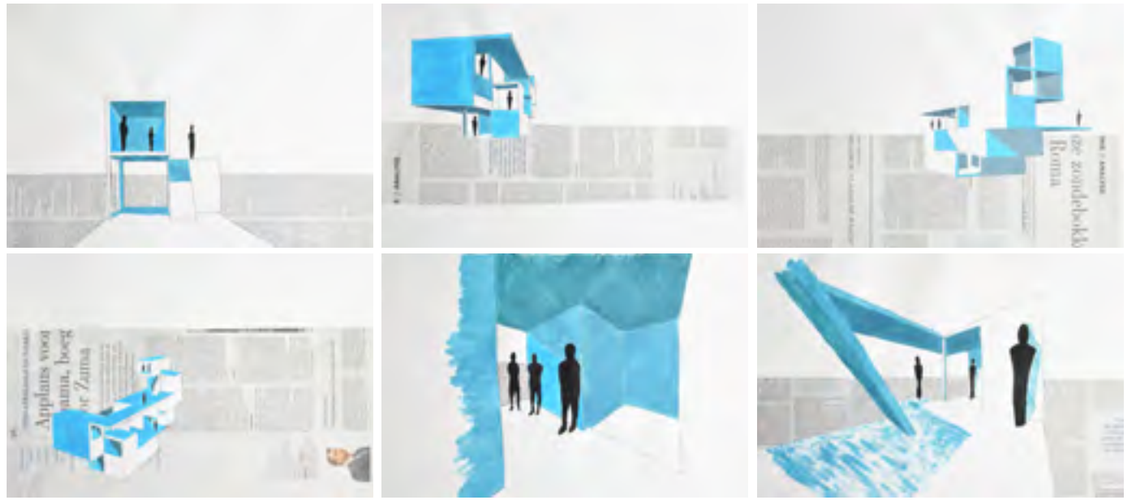
Charcoal Renders, plural authors



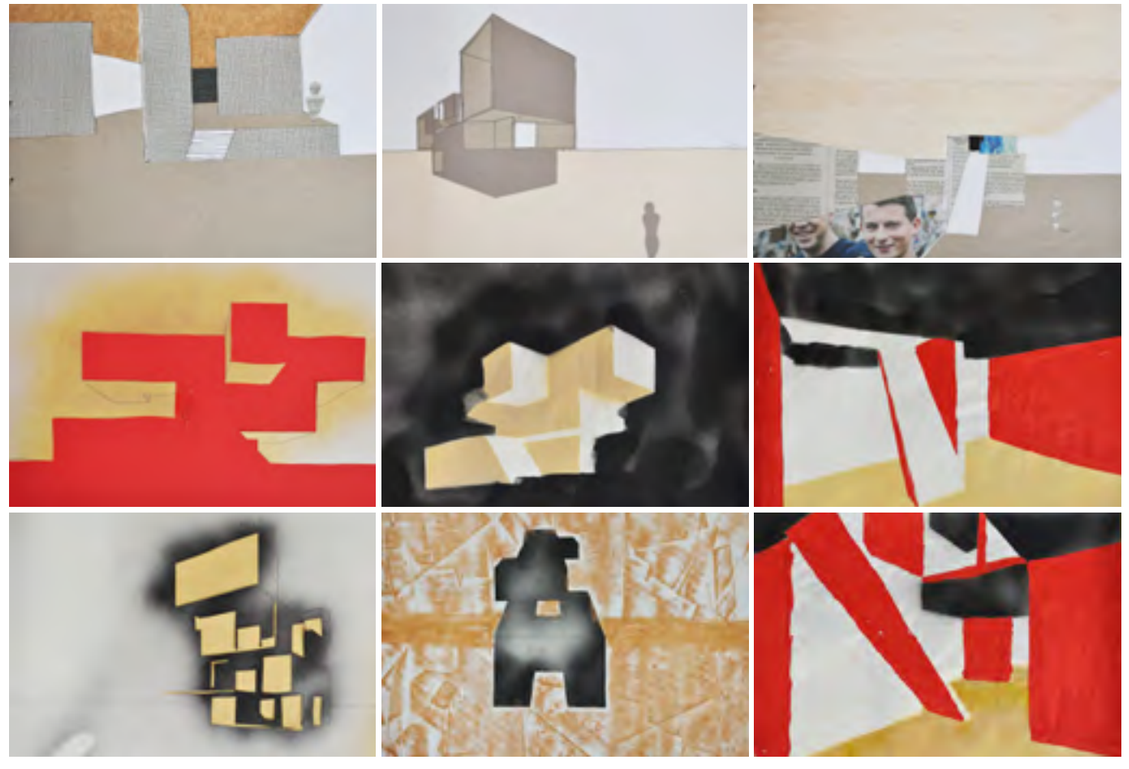
Davina Decoster



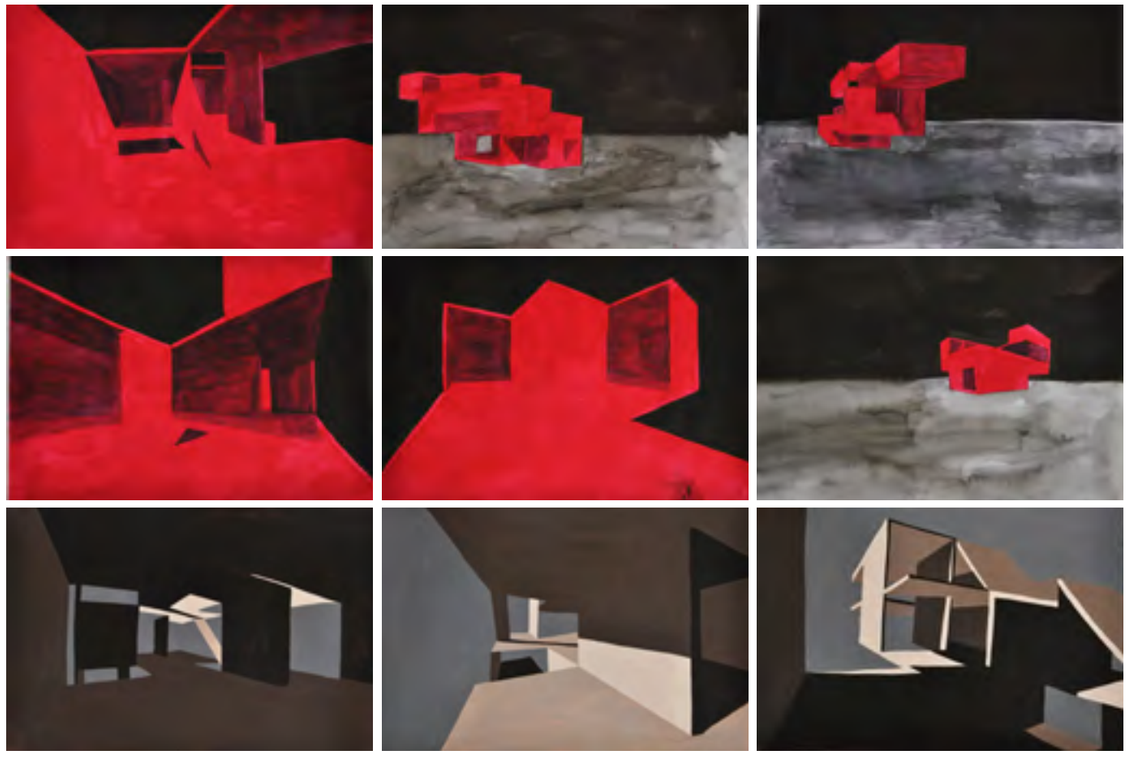
Tom Schoonjans

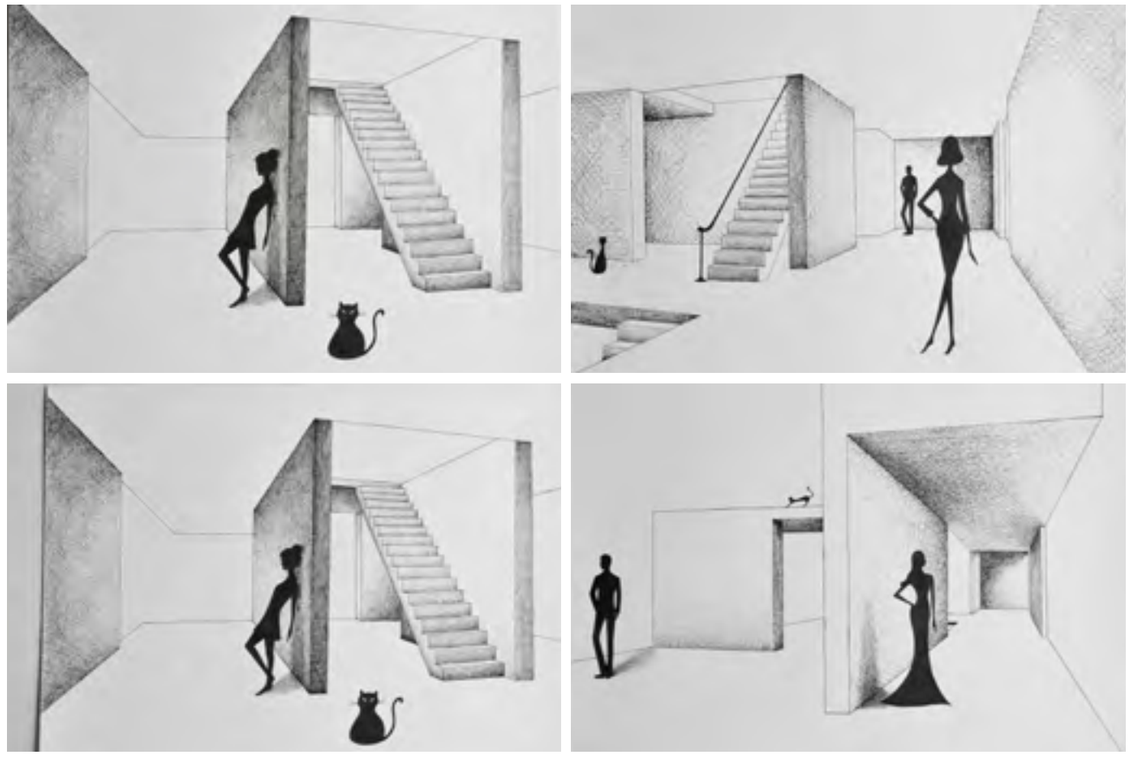


Max Stabel

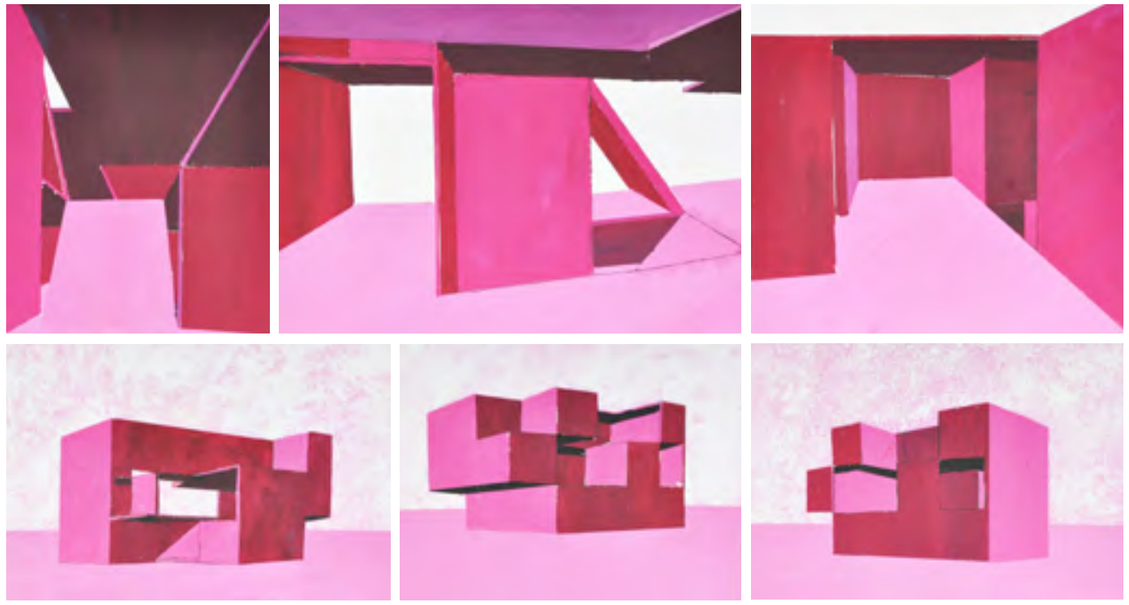


Robbe Roggemans





Pauline Truyens

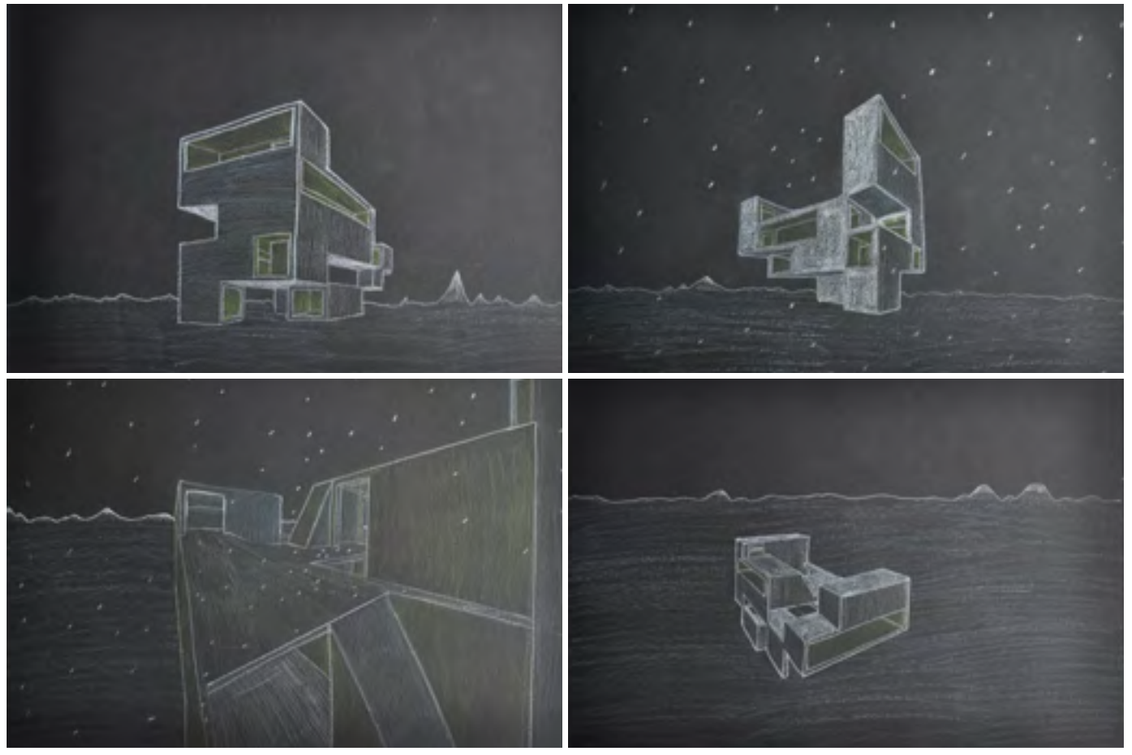


Laura Reyniers

Tuur Vermeiren

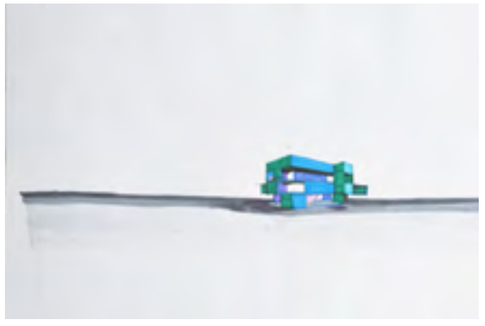
Kristien Naetens

Heleen Verheyden



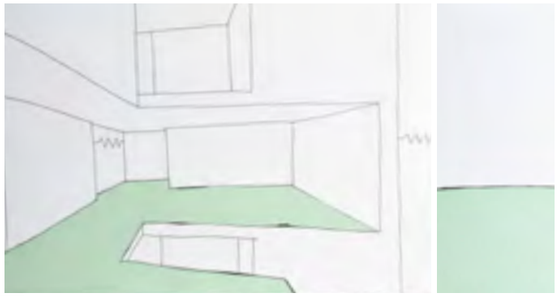
Elena Verenst

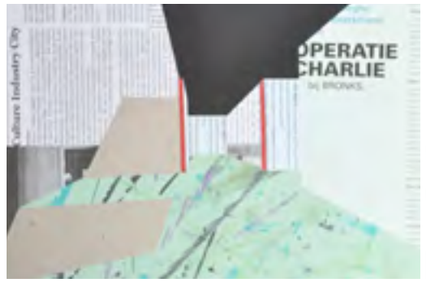
Lea Parreyn

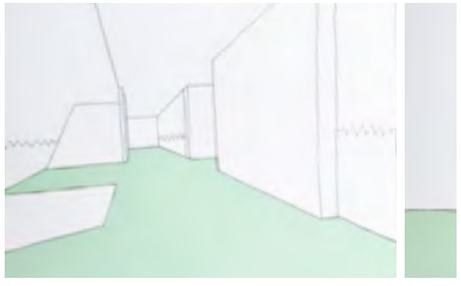







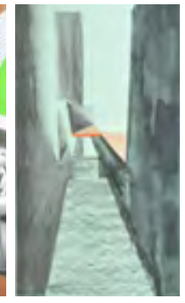








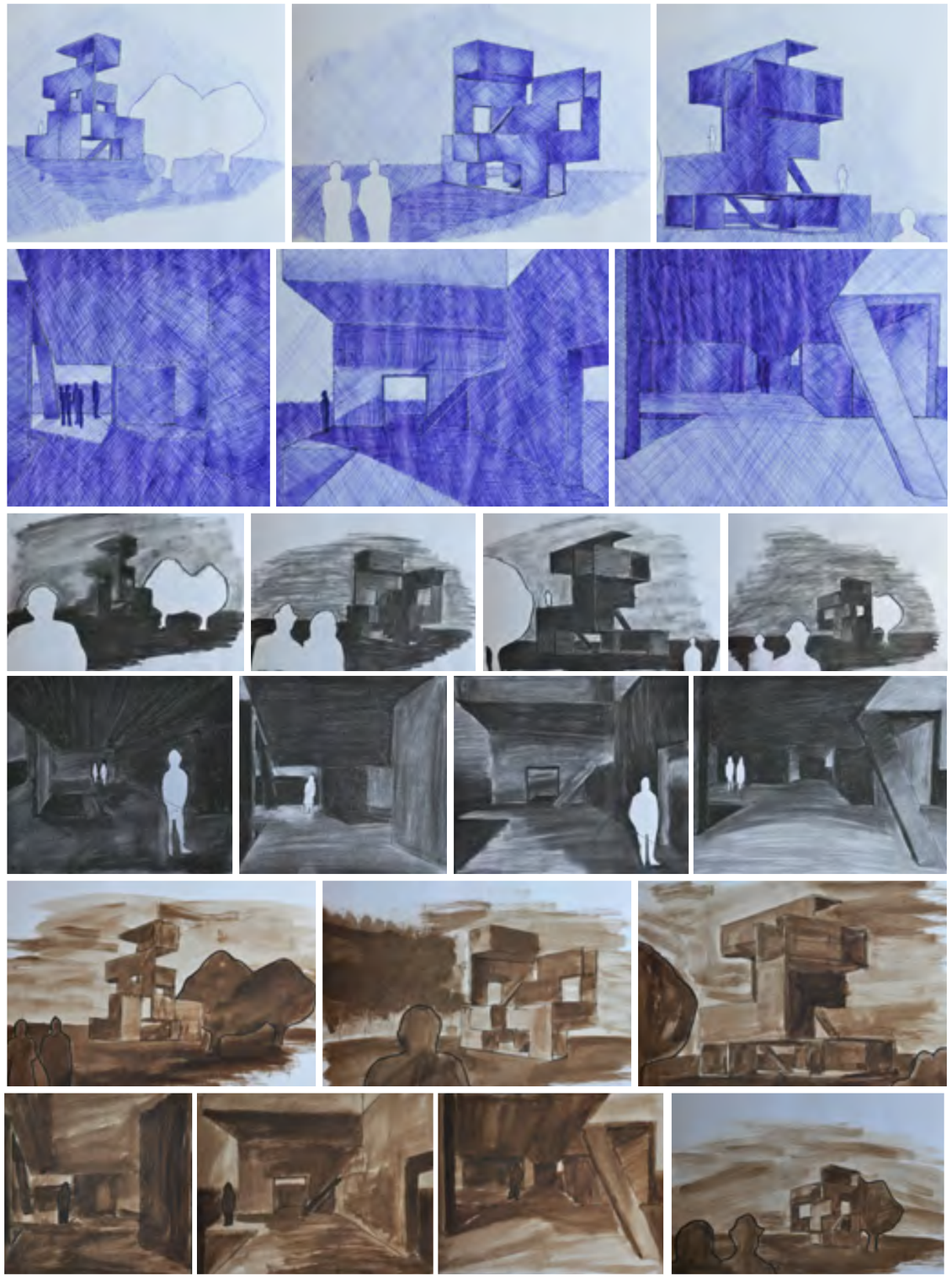






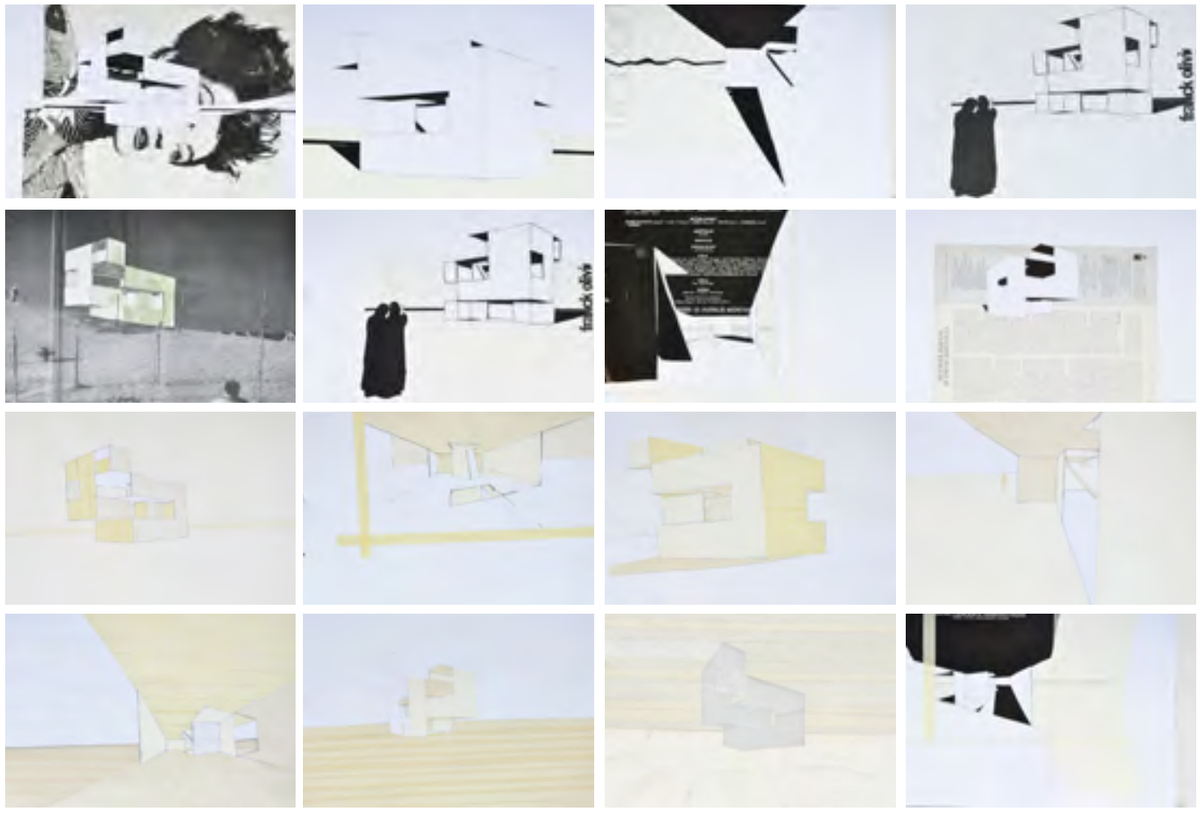


Anton Parys

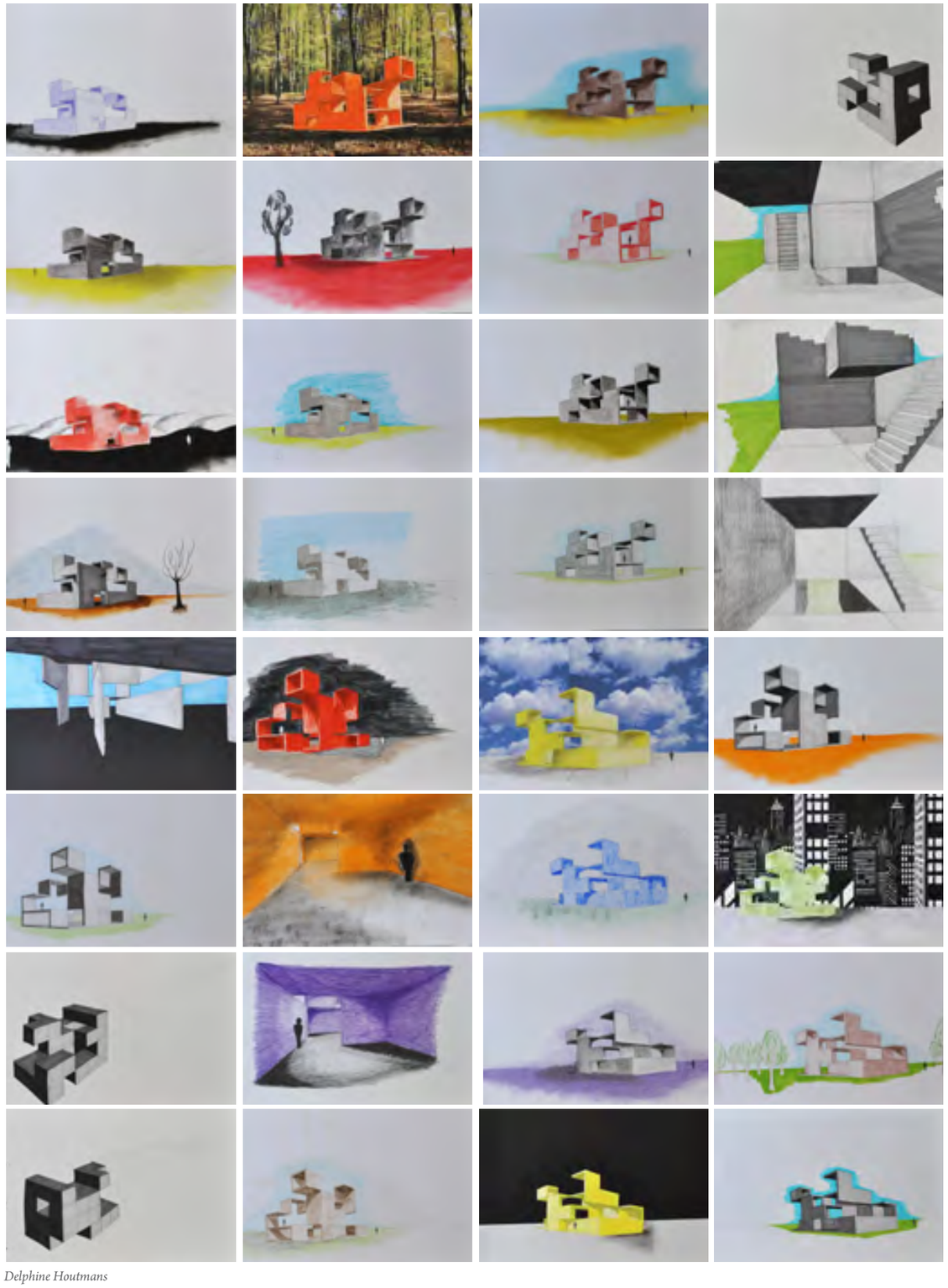


Lynn Janssens

Rijntje Jacobs

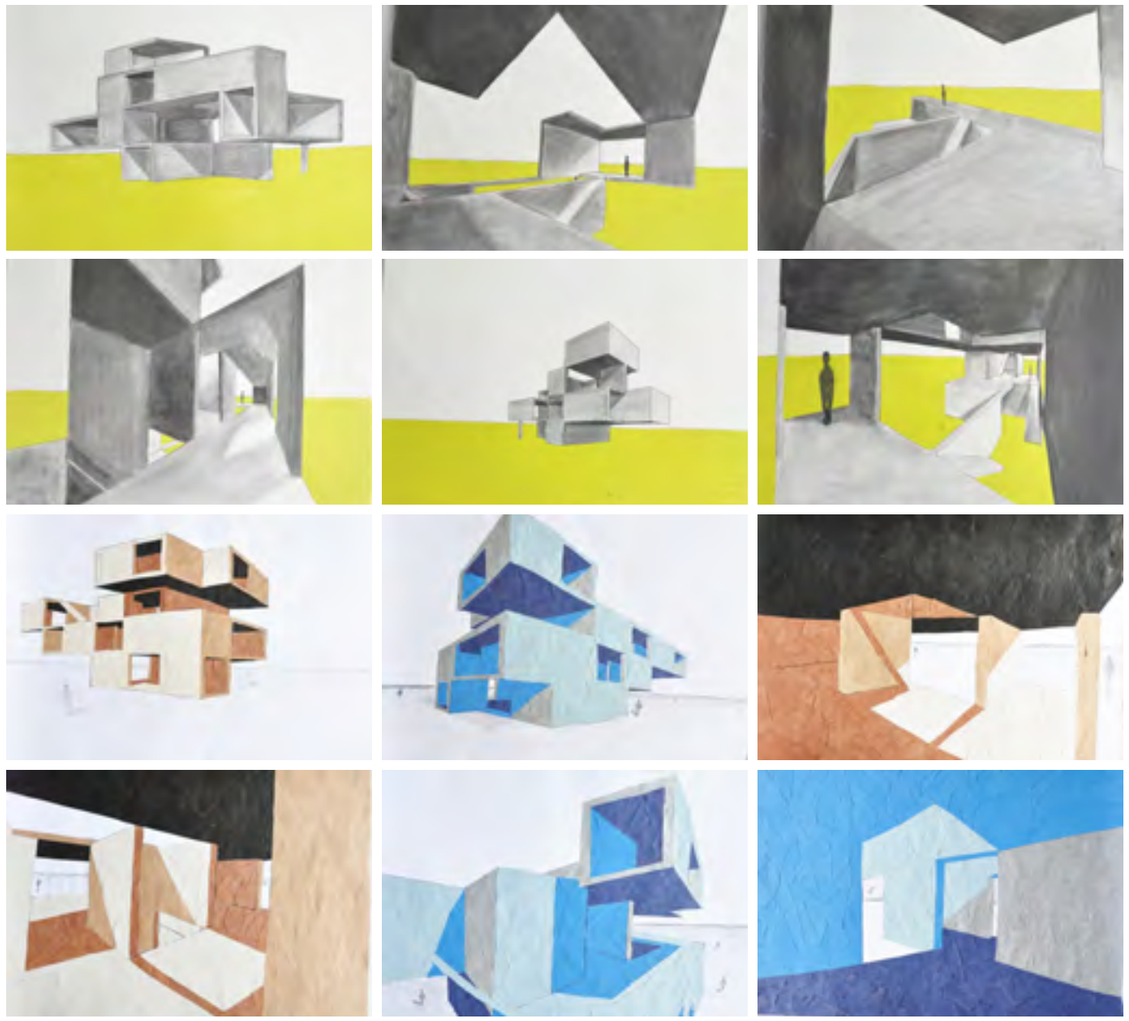


Rosa Fens

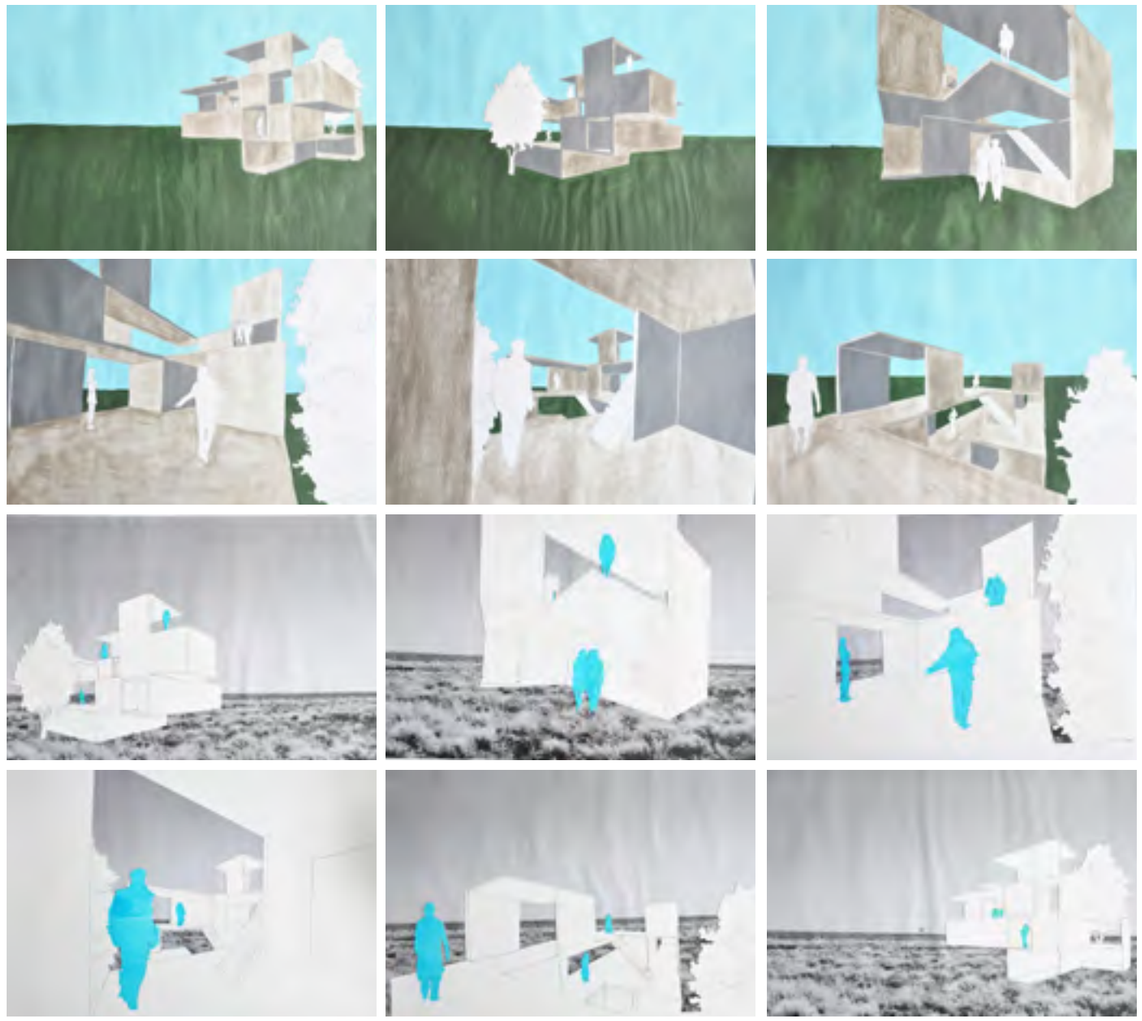


Delphine Houtmans

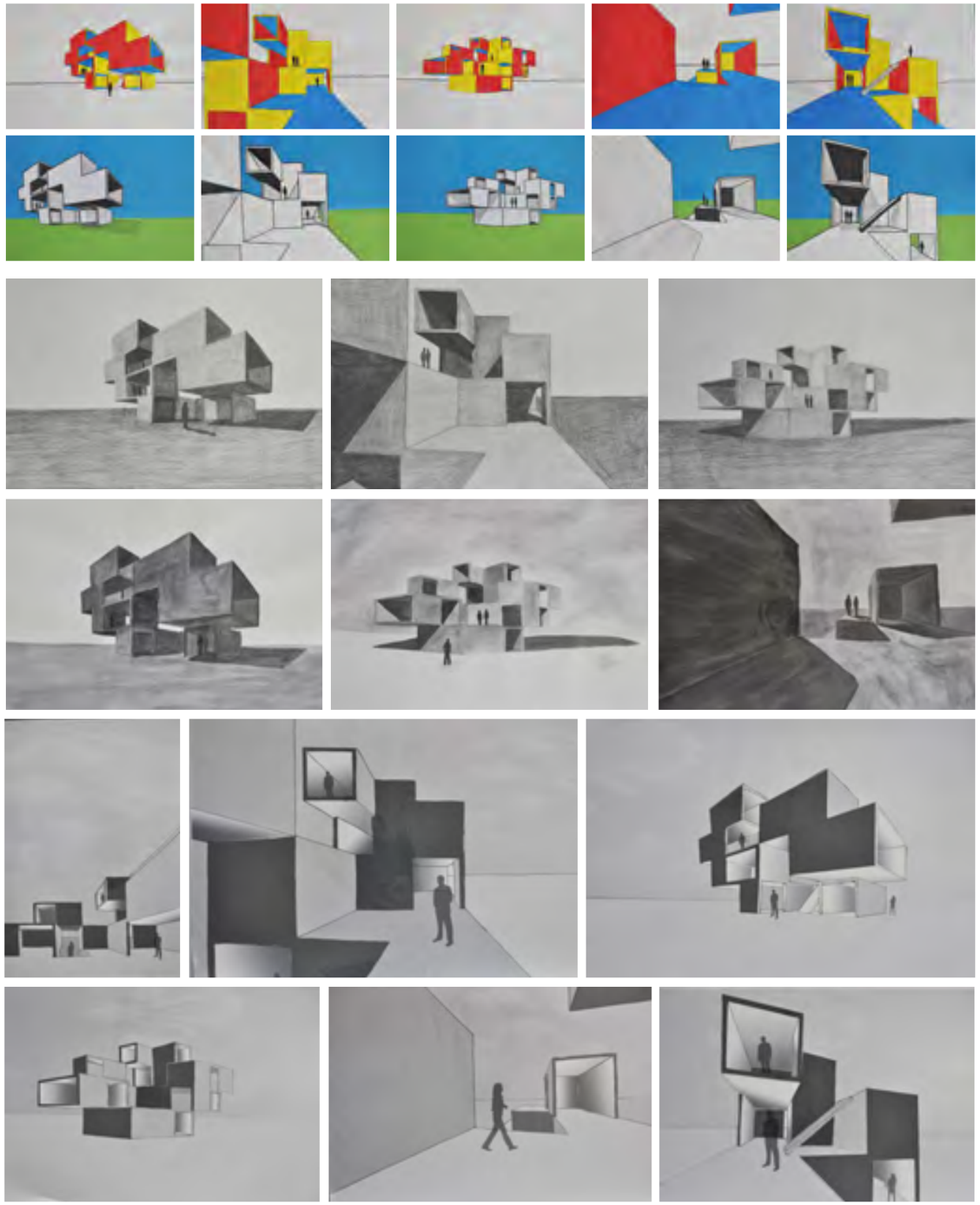
Isaura Doumen



Caro Baens



Eline de Borger



Kaatje de Boelbaep

notes

1 “I’m starting precisely there, where pictorial form begins, with the point that is set in motion. (...) Free and unbound (...) a kind of walk for its own sake. Without destination.” Paul Klee November 14th 1921 in, Bonnefait, R. Dobbe, M., Eggelhöfer, F., (eds.) (2014); ‘Taking a Line for A Walk’, Zentrum Paul Klee

2 Arnheim, R., (1954-1974), Art and Visual Perception: A Psychology of the Creative Eye. Berkeley and Los Angeles: University of California Press

3 Butler, C.H., de Zegher, C., (2010), On Line, Drawing Through the Twentieth Century, Museum of Modern Art, New York, p.23

4 Butler, C.H., de Zegher, C., (2010), On Line, Drawing Through the Twentieth Century, Museum of Modern Art, New York

5 see amongst others Giorgio Morandi, Sol Lewitt, Roland Seuphor, Josef Albers, Agnes Martin, Cy Twombly, Piet Mondriaan, Atsuko Tanaka, Vera Molnar, Nasreen Mohamedi, Giuseppe Penone, Susan Hefuna, Julie Mehretu,

6 Sullivan, C., (2004), Drawing the Landscape, Wiley

7 Paul Laseau (1999)Freehand Sketching, an introduction, Wiley

8 Sullivan, C., (2004), Drawing the Landscape, Wiley, p.99

9 You can use a vector-based illustration application or a proper CAD application to execute the following drawings. Try to look for an application with a 3D modelling engine.

10 Because we are using parallel projection we are able to shift this line to reveal different parts of our structure. Something we will not do within this exercise but keep in mind you can shift section lines, even break them up to reveal different parts of a structure. Keep in mind planimetric representations revolve around legibility, do not overdo the shifting and breaking. The most communicative way to cut a building is by using a straight line, if your structure demands divertion, try to keep it clear for the reader to follow the shift(s).

11 There is a geometric way to calculate the shadows, based upon shadow theory. I would like to refer to Francis D.K. Ching’s Design Drawing, or any other publication which covers the topic as including it within this manual would divert our attention too much. When you direct a spotlight onto your model try to keep it at 45º angle (emulating the conventionalized direction of the shadow theory). Alternatively you can add a spotlight when building your virtual 3D model. (See further in this manual)

12 I used Nemetschek’s VectorWorks to develop my drawings but it goes without saying that any CAD package with a 3D engine will do.

13 It will serve you in the future when keep all your files in one folder of your computer system. Later you can add sub-folders but for now you do yourself a favour if you start working from one folder named something recognisable similar to the titles of your files. Saving your file should become a second nature, saving your file every time you have drawn something. Some applications provide a function which reminds you to save after a certain time elapsed. Not saving your file runs the risk of loosing large chunks of a drawing when the computer decides to crash on you.

14 Scolari, M., (2012), Oblique Drawing, MIT press

15 see amongst others: Theo van Doesburg, El Lissitsky

16 Fraser, I., Hemni, R., (1993) Envisoning Architecture John Wiley & Sons

17 Choisy, A., (1873) From l’Art de Bâtir Chez les Romains, Paris: Ducher et C.ie; and ; (1899); Histoire de l’architecture, Paris: Gauthier - Villars

18 I used Nemetschek’s VectorWorks to develop my drawings but it goes without saying that any CAD package with a 3D engine will do.

19 Remember to save your files from time to time

20 There are several ways to draw the stairs. Extrusion: By drawing a larger 3D object on a 45º angle which is used as a guide to subtract the other half of the prism. Remodelling the cube so that it becomes prism. Extruding a triangle towards a prism remains the quickest and easiest way.

21 Sullivan, C., (2004), Drawing the Landscape, Wiley

22 Laseau, P., (1999), Freehand Sketching, an introduction, Wiley

23 Sullivan, C., (2004), Drawing the Landscape, Wiley

24 Laseau, P., (1999), O.C., p.23
Alfred-Maurice, Friar, (1939), Het Natuurschetsen aan het Hoger Instituut Sint-Lucas Gent, Afdeling Kunstdruk, Sint-Lucas Doornik, p.XX

26 Video essayist Kogonada previously made some brilliant observations about the visual obsessions of some of cinema's greatest formalists. Stanley Kubrick, as Kogonada elegantly points out, composes most of his shots using one-point perspective. Once called out, it becomes a motif that's really hard to ignore. Yasujiro Ozu – a director who has more cinematic eccentricities than just about any other major director – had a fascination with windows, doorways and corridors.For his latest essay, Kogonada studies Wes Anderson's use of central perspective symmetry. Kogonda observed that Anderson consistently organizes the elements in his frame so that the most important thing is smack in the middle. (source: Crow, J., The Perfect Symmetry of Wes Anderson's Movies, openculture (http://www.openculture.com/2014/03/the-perfect-symmetry-of-wes-andersons-movies.html) accessed june 2015 / https://vimeo.com/89302848)

27 Technique attributed to Adriaan Van Haaften, [Van Haaften, A., (2011), Uit De Hand, schets-vaardigheden in de bouwkunde studie, Publikatieburo Bouwkunde]

28 $5/8^{th}$ from the bottom of a cube, for convenience a fraction below 3/4th

29 During the sessions isometric and axonometric perspective was used to draw the folds. In retrospect using an oblique, or cavaliere, seems like the most apt way of drawing and exploring them as they allow you to start from the actual section and draw a series of variants without having to redraw every new possibility.

30 This is a convention, within the sessions we drew the exploded views of the X fold in a right handed view, the Y fold in a left handed one. You can, off course change this convention.

31 You can design your stairs any way you want to but for the course of the exercise we will use a 'mirrored' stairway. For the course of this exercise we have also excluded nosing, the area extending the tread.

32 I learned this great trick while working with Peter Drijver of Scala Architects in the Hague. You study and mark all the inconsistencies using a blue pen. Then as you start processing them in the computer you use a red pen to mark out all the improvements and or inconsistencies you already processed. As such you know what you have done and, in an office environment where drawings tend to switch hands a lot, other parties know what you have indicated and, eventually, already improved within the digital file.

33 Techniques are understood as drawing and rendering techniques. Think of charcoal, pencils, ballpoint pens, coloured pencils, india ink, pastel chalk, felt tip markers, fountain pen, fine liner pens, acrylic markers, acrylic paint, watercolours, oil paint, collage, oil pastel, even sewing, monotypes or spray paint...